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JUNIOR FARMERS AT GATTON COLLEGE.

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Contents

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Page.

Fodder Conservation—

Farmers Beat Drought. By I. F. Swan 191

Cows Well Fed on School Dairy Farm. By R. T. Weston 195

Dairying—

New Butter Churns. By W. D. Mitchell 199

Managing Dairy Heifers After Weaning. By C. H. Clark 205

A Useful Milk Can Lid. By H. G. Dougherty 209

Milk Test Can Show Farmers Way to Higher Price. By T. A. Morris .. 211

Horticulture—

Apple Growers Favour Three Varieties. By M. A. Hannigan 217

Grow Early Papaws With Irrigation. By G. W. J. Agnew 221

If Your Tomatoes Lack Magnesium. By S. E. Stephens 225

Sheep and Wool—

Some Hazards of Sheep Husbandry 228

Improvements Bring Rewards 229

A Letter From Ballyrandoo 244

Veterinary—

Know the Tick that Causes Paralysis. By P. H. McCarthy 230

Treat Stake Wounds in Horses Quickly. By D. J. Webster 235

Poultry—

Coccidiosis of Poultry. By P. J. O'Sullivan and B. W. Moffatt 237

Fauna—

Queensland Fauna Sanctuaries. By C. Roff 245

The Farm Family—

Junior Farmers Aim at Good Citizenship. By J. Park 247

Careers for Country Boys and Girls. By E. T. Hockings 251

Miscellaneous—

Tuberculosis-free Cattle Herds 208

Brucellosis-tested Swine Herds 224

Editor: E. T. Hockings.

Subscription Rates: Queensland farmers, schools and students—5s. per annum; others—£1 per annum.

Plate 1.

Still Some Feed Left. When drought-breaking rain fell in February, there was still some feed left in the shed on Messrs. Hunt and Son's farm at Munbilla.

Farmers Beat Drought

By I. F. SWANN, Assistant Adviser in Agriculture.

Mr. S. Hunt and his son, Ralph, of Munbilla, near Harrisville, haven't lost a beast through drought in 33 years.

At the end of October 1957 they still had 15 tons of lucerne hay and 48 tons of silage. This carried them through until they got good rain early in February.

Their 40 pure-bred Jerseys were milking quite well. They averaged 27 lb. of commercial butter per cow in October. This in itself is not an outstanding achievement; but a good season's production is ahead.

Mr. Hunt is satisfied that they have withstood this drought well. He emphasises, however, that they are not unique among their neighbours. Throughout the Milora area there is ample evidence of sound farming, noticeably fodder conservation and soil conservation. In fact, remarks on Mr. Hunt's property in this article could well apply to many other farms in the locality.

The farm under discussion covers an area of 247 acres, mostly silver-leaved ironbark country. To withstand drought and seasonal shortages, father and son have found that they must conserve feed. This is particularly so because they have no irrigation water available.

TWO TYPES OF FODDER.

They use two types of conserved fodder for two different purposes:

(1) Lucerne hay is used practically every spring as a seasonal reserve. They have 20 acres of fairly good

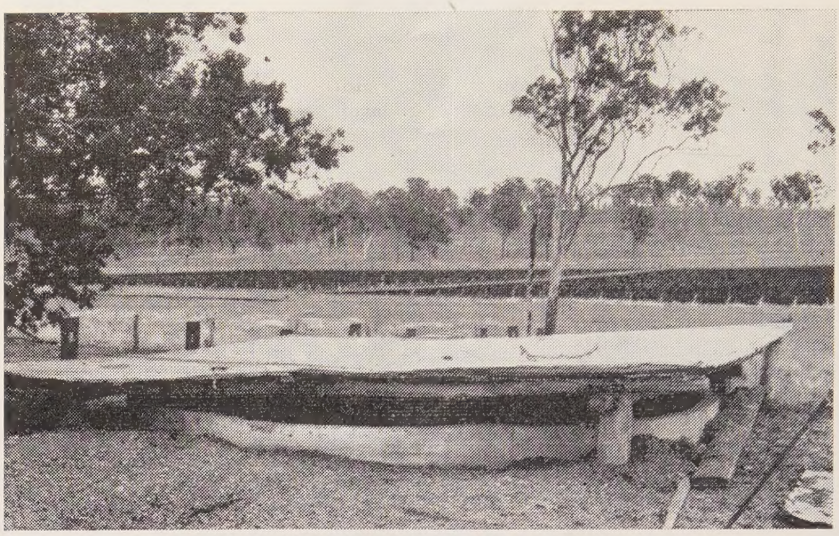


Plate 2.

A Sliding Roof Covers This Pit Silo. Silage helped to keep cows milking through the dry spell and paid dividends for Mr. Hunt and his son.

Plate 3.

No Drought Here! A good-sized litter of pigs on the Munbilla farm (in the Harrisville district).

lucerne which is baled and used to fill their 100-ton hay shed. When required it is also used for grazing purposes.

(2) Forty-eight tons of sorghum ensilage are held in a pit silo as a drought reserve. It has been used for this purpose 14 times during the past 20 years.

Mr. Stan Hunt originally filled the silo using hand labour. This he says involved a lot of work but was a reasonable method when used as a drought reserve.

Last summer Mr. Hunt and son engaged a contract forage harvester to fill their silo at 12s 6d. a ton. The use of modern equipment made the work of filling the silo so much easier that they now look upon silage as a suitable seasonal reserve also.

FOR PIGS TOO.

These two farmers rate silage very highly as a feed for pigs and young calves as well as for milkers. Therefore the prospect of making it cheaply enough to feed every spring really appeals to them. This season they will fill another 48-ton pit silo that is on the property. Sorghum is most commonly used to make ensilage. It is grown on the lighter soil that is not so safe for winter crops.

Stored hay and silage take care of seasonal and drought shortages, but, to be really effective, Mr. Stan Hunt claims that this must be part of a sound farming programme.

Soil type and weather conditions are used to advantage in planning winter grazing. The heavier soil on the farm is ploughed for oats each year before the monsoonal rains commence.

Three or four workings of the fallow enable a normal 30 acres of oats to be grown on the preceding summer's rain.

The planting of Algerian oats is commenced early in April and continues until late July.

IMPROVED PASTURES.

Pastures, of course, provide the main summer grazing, and Mr. Ralph Hunt has directed thought to improving them.

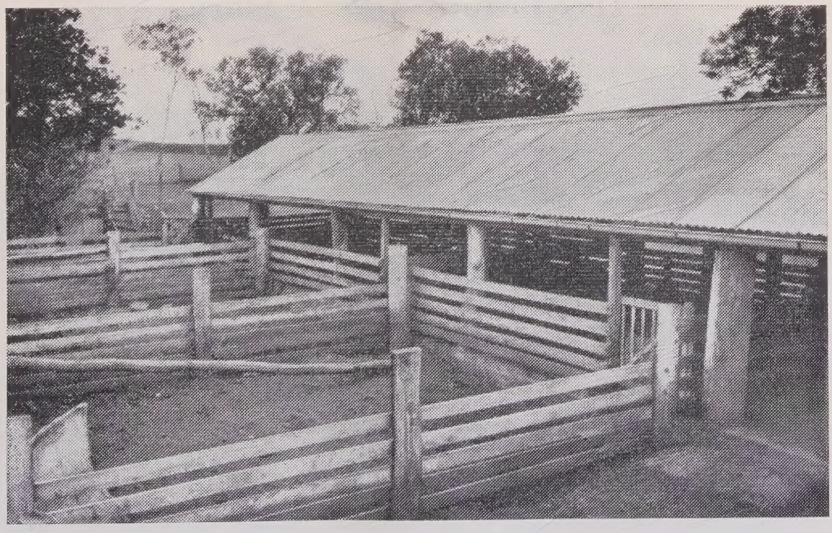


Plate 4.

Pig Accommodation At Munbilla. Pigs are a profitable sideline, and provision is made for them in the silage programme.

Last autumn he planted six acres of former cultivation to a mixture of green panic, lucerne and barrel medic. Because of the drought the green panic did not strike last season but showed signs of developing a reasonable stand this spring.

Lucerne and barrel medic germinated well during the winter.

Mr. Hunt and his son have plans for pasture improvement on more of the farm. The form that this improvement will take depends upon the success of the small area already planted.

Pigs have been a very profitable sideline over a number of years.

These farmers have found that their pigs, in addition to requiring good housing and husbandry, need consideration in the fodder conservation programme.

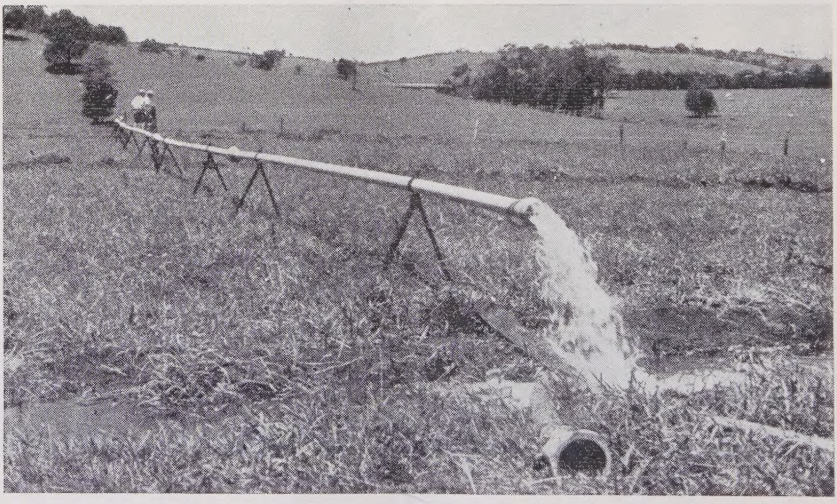
Two grain crops are grown annually to provide for: (*a*) the five sows and their litters which generally are reared to the light bacon stage, and (*b*) the poultry.

A summer crop of 10 acres of maize is normal; last year the hybrid Q440 was grown and found very successful.

Twenty acres of wheat is a normal planting. The same rules of fallow apply here as apply to the oat crop. The success of the system was evidenced this year, when a crop of 59 bags was harvested from seven acres. The crop received only 439 points of rain during its growing period.

Mr. Hunt and his son practise crop rotation and varying depths of ploughing. To ensure soil fertility for future generations they have begun soil conservation work, and this work is to be extended to protect the entire farm.

This Picture Tells A Story



Contour Ditch Irrigation is Opening Up Large Areas of Land to Valuable Pasture Production.

Cows Well Fed On School Dairy Farm

By R. T. WESTON, Dairy Adviser.

Good quality cows, well fed.

This is the basis of the management policy laid down at the Nambour High School for its six-and-a-half acre farmlet on the outskirts of the town.

The School Principal, Mr. T. Maher, recognises that dairying in Queensland has a reputation for low average butterfat production. He believes there is still room for improvement in dairy cattle quality, but that the main reason for low production is poor feeding.

As the farm is small an intensive system is practised so that a high return per acre and per cow may be obtained. The property is at present carrying 13 head of stock—six cows and seven heifers. The foundation animals were purchased from leading Jersey studs and are good dairy types.

The heifers, some of which are the result of artificial insemination, are well grown and of good type. They will be worthy additions to the school herd and their entry into production will enable the disposal of one or two of the cows. These cows are aged although still producing remarkably well under the existing system of husbandry.

HERD PRODUCTION.

A progressive step was taken when it was decided to submit the small herd for recording under the Group Herd Recording Scheme operated by the Department of Agriculture and Stock. The five cows that completed lactations during 1956-57 produced an average of 276 lb. butterfat over 300 days. The top cow in the herd actually milked for 330 days to produce 425 lb. butterfat. In terms of money each cow gave a return approximating £5 10s. for every month of the year, whilst the total butterfat production of 1,590 lb. butterfat for the year is equal to £50 per acre.

These returns provide a striking contrast with district and State dairy production. The average of all cows recorded under the Group scheme is only 149 lb. butterfat with an average lactation period of 231 days, whilst the district averages are 137 lb. and 264 days respectively.

It has long been realised that feeding is the limiting factor in lifting dairy production to a higher level. It is Mr. Maher's contention that dairy cows must be adequately fed if increased production is to be obtained. The school's policy has been framed to prove that cows can be fed to the maximum of their capacity without incurring excessive feed bills. The key factor has been shown to be the provision of good quality home-grown fodder in adequate quantities.

In order to implement this feeding policy, it has been necessary to provide various fodder crops to supplement the pastures, which are naturally restricted in area on such a small property. The whole of the cultivated area is kept in use throughout the year, provided the weather conditions are reasonably favourable.

IMPORTANCE OF ROUGHAGE.

Fodder cane in winter, and maize and saccaline in summer, form the basis of the ration. These fodders are

Plate 1.

Dairy Cows at the Nambour High School's Farm Grazing Oats and Tares During Spring.

chaffed and fed to the stock in recently-constructed stalls adjacent to the milking shed. Grazing crops such as oats, field peas and vetches provide valuable additions to the ration during the winter and early spring months.

Strip grazing is carried out by the use of an electric fence, the stock usually being given access for a 20-minute period twice daily. The system of intensive cultivation usually results in more feed being available than can be comfortably handled by the stock. Soil fertility is maintained by the regular application of superphosphate, applied at the rate of a little over one bag per acre.

Each milking cow receives up to 25 lb. of chaffed roughage per day when seasonal conditions make the extra ration necessary to maintain production. Lucerne hay is purchased and stored during times of plenty when prices are comparatively low and this safeguards the herd during dry periods. Such a form of drought insurance could well be followed by farmers whose farms are not suitable for the cultivation of fodder crops.

The only regularly purchased stock food is a mixed dairy concentrate containing 18 per cent. protein, which is fed at the rate of 2 lb. per cow per day throughout the year. This is equal to a cost of 8d. per day or £1 per month for each cow. During the winter months this is supplemented by 1½ lb. maizemeal daily which is produced on the property. This year 10 bags of maize were produced, the value of which could be assessed at £30 or approximately 4d. per lb. at average market rates.

The cows are allowed the recommended dry period of six to eight weeks, during which time they receive 2 lb. of concentrate daily to supplement the pasture ration. A fortnight before calving they are brought on to the full ration given to the milking cows.

The pasture area of four and a half acres consist of kikuyu, paspalum, and clover with a little mat grass. Although no topdressing of the pasture has been carried out, the

coverage of natural white clover appears to be increasing. This is certainly very noticeable in one of the cultivation paddocks, where the use of superphosphate for fodder crops has stimulated clover growth to such an extent that the area is to be reverted to pasture.

MACHINERY.

The recent acquisition of a Ferguson tractor enables all farm work to be performed without the necessity of hiring machinery. Other implements include disc cultivators, mouldboard plough, mower, hay rake, tiller and single row scuffler.

PROFITABLE SIDELINE.

Surplus skim-milk from the school herd is fed to pigs, which also receive home-grown arrowroot and sweet potatoes to supplement the ration. Weaners are purchased regularly and sold at porker weights. This quick turn-over is a most profitable addition to dairy herd income.

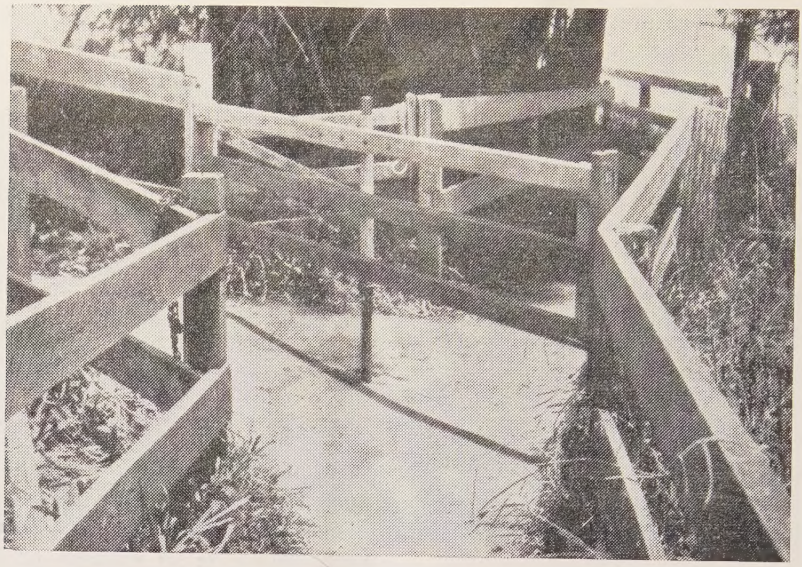
GOOD MANAGEMENT SETS EXAMPLE.

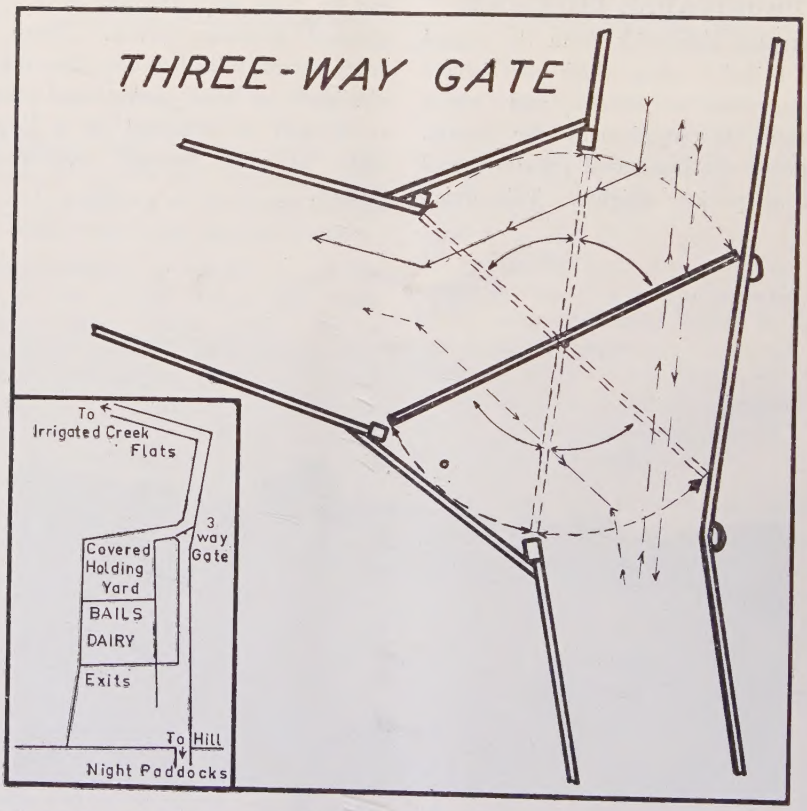
In analysing the results obtained on this small property it should be realised that it is necessary for the farm to be run economically. Provision has to be made from the farm income for the purchase of stock, any necessary fodder, seeds and fertilizer.

This is intensive, non-irrigated farming at its best. The amount of fodder available on the property at a time when seasonal conditions were very adverse is an example of what can be done with the aid of a well planned farming system. There is every reason to believe that the results obtained on this pocket-sized farm could well be achieved on a larger scale by the average commercial farmer.

Plate 2.

A Fodder Crop of Japanese Millet at the School, With a Good Stand of Cane in the Background.





A progressive dairyman in a high rainfall area shows how to control mud and cows at the same time. He uses narrow concrete paths leading to and from the bails area. He uses a 3-way gate to put his dairy cows where he wants them—with efficiency and ease.

New Butter Churns

By W. D. MITCHELL, Dairy Technologist.

The successful operation of a fully insulated, stainless steel cylindrical butter churn in the Kingston factory during the 1956-57 butter production season has ushered in a new era in butter manufacture in Queensland. Metal, which is used widely for all stages of processing of dairy products, has now been employed successfully by Queensland industry for butter churning.

The use of metal churns for butter manufacture is not new. They are common items of equipment in the dairying countries of Europe and America. They are also in common use in Victoria.

This James Bell unit, the first of its type in Australia, was installed in August, 1956, and has been used continuously for manufacturing operations. Although it is not the first metal churn used in Queensland, it is the first to have provided butter of a satisfactory texture under normal factory conditions.

A rollerless aluminium alloy metal churn of cubical design was used in the Laidley butter factory in the spring-summer period of 1942. However, because of the influence of atmospheric conditions, it was not possible to produce a butter with a satisfactory texture.

The atmospheric temperatures of Victoria are not disadvantageous for the use of uninsulated metal churns, although even in that State external cooling during hot weather is provided.

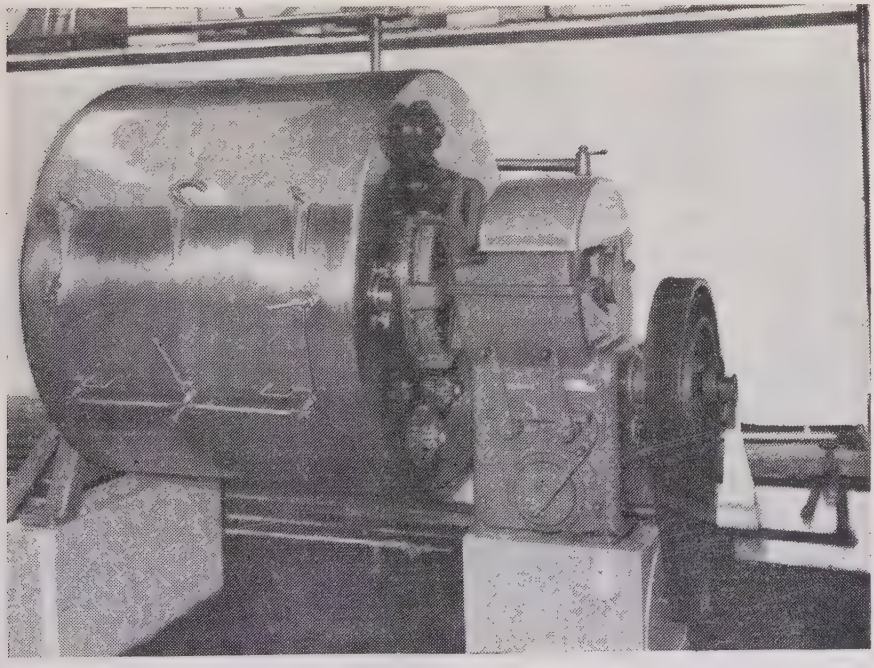


Plate 1.

James Bell Fully Insulated Stainless Steel Barrel.

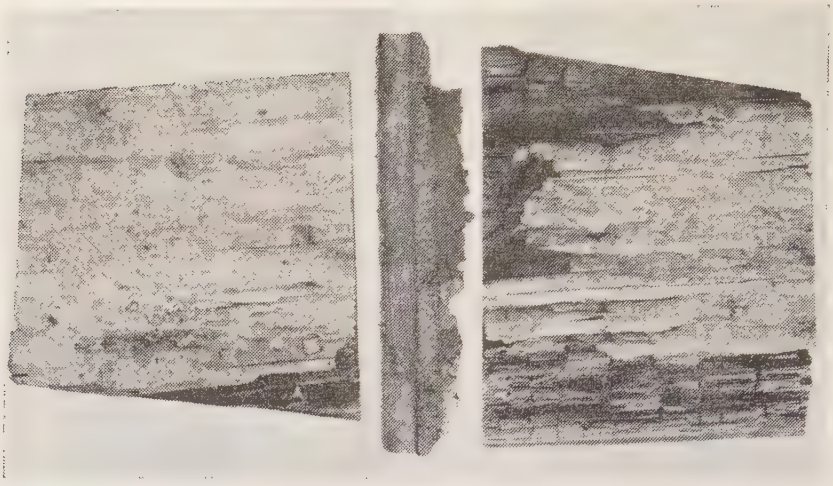


Plate 2.

Face Views of Barrel Stave Affected by Fungus Deterioration. Left hand piece (internal face) shows little attack, right hand sample (external face) shows severe deterioration.

ADVANTAGES OF METAL.

The use of metal churns for butter manufacturing operations has been adopted because of several major advantages when compared with the traditional wooden churns of Australia and New Zealand.

One of the major difficulties with timber barrels is their susceptibility to damage by wood-destroying fungi. The types of wood in common use are Indian teak (*Tectona grandis*), New Zealand kauri (*Agathis australis*), Canadian redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga taxifolia*), Queensland kauri (*Agathis palmerstonii*) and White beech (*Gmelina leichhardtii*). While these differ in their resistance to the type and extent of rot deterioration, experience has shown that their working life is limited. This deterioration, resulting from specific fungus infection, is more common in hot, humid countries. The results of fungi attack on timber are shown in Plates 2 and 3.

An added difficulty with timber has arisen because of a lack of suitable supplies of the necessary heartwood portions used in barrel fabrication.

Secondly, butter is a perishable product. Like all other dairy products it is subject to bacteriological contamination. Yeast and mould bacteria, coliform organisms, protein-digesting types, and fat-splitting types all impair the quality of butter. Wood is difficult to clean because of its porous nature and in churn barrels in particular the cleaning process is more difficult because of the stave seams in the barrel's surface. In addition, timber surfaces dry out in the hot dry winds common to Queensland summer conditions, thus further exposing internal surfaces to cream penetration.

It is possible to keep wooden surfaces clean, as demonstrated by departmental examinations done regularly on Queensland butters under the Butter Improvement Service analyses. However, it requires much and constant care to maintain this condition. Metal surfaces, on the other hand, are more readily cleaned and for this advantage alone must be regarded as superior for the manufacture of foods.

Metals possess the advantages of almost permanent life and a high degree of sanitation. As most of the new units are made of stainless steel, the barrel is constructed of a highly-resistant material.

Another major advantage of metal churn barrels is their ease of installation. It is necessary to pre-swell wood prior to use to ensure a crevice-free, tight internal surface. This may require treatment for 1 to 2 weeks before the surface is satisfactory. But this is not necessary with metal units.

Construction.

The Kingston all-metal unit (Plate 1) is constructed of two stainless steel shells, namely an internal sheet of 5/16-in. mild steel coated with a 1/16-in. layer of stainless steel, and an external sheet of 16-gauge stainless steel. The internal sheet is a specially laminated steel known as "Colclad." A 2-in. layer of "Onozote" material is fitted between the shells for insulation and provides insulating properties similar to the traditional wooden units. This insulation minimises any adverse interference from atmospheric conditions.

The weight of this barrel is similar to that of the conventionel wooden unit and it is possible to fit the barrel onto existing gear mechanism. This enables a major saving in capital outlay for new equipment. The unit contains the conventional wooden rollers, although experimental stainless steel rollers have been fabricated and will be tested in another barrel this season.

OTHER TYPES.

Several types of metal churns are manufactured although the octagonal aluminium alloy unit has been the only one used for many years. The other units are only now being introduced.

A brief description of these is given:

(1) *Scott "Challenge"* (uninsulated) (Plate 5.)—This is extensively used

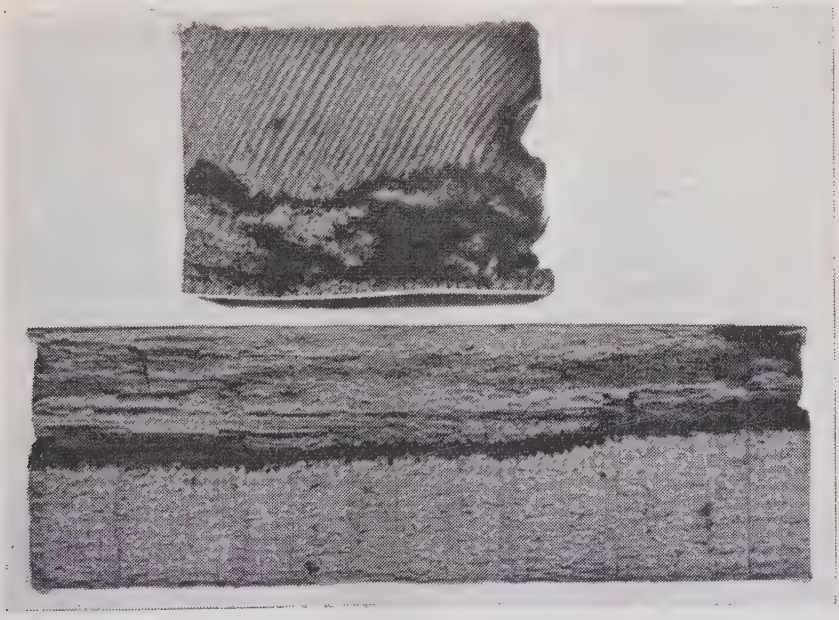


Plate 3.

Cross Section of Rotted Barrel Stave. Note depth of deterioration from external face.

in southern States and is fabricated from $\frac{5}{8}$-in. cast silicon aluminium alloy. It is noteworthy that the design is cubical, with the axis of rotation through diagonally opposite corners. The peculiar shape ensures maximum concussion during churning. As this churn has no workers its shape is also used to obtain the required degree of mixing during working. Two sizes, 2,000 lb. and 1,200 lb., are fabricated.

(2) *Scott-Gosselin* (uninsulated) (Plate 6.)—This barrel is of stainless steel construction, and large-capacity units are being constructed in Melbourne. The first churn manufactured in Australia, an 80–90 box churn, was installed by the South East Dairy Co., Yarrum, Victoria, in September, 1957. A 40-box churn has been ordered for Singleton butter factory in New South Wales.

A feature is the rollerless design, special vanes being provided on the internal surface for temperature control during manufacture. Butter wash water can be injected and hot and cold water may be recirculated.

During September and October, 1957, the C.S.I.R.O. and Victorian Department of Agriculture examined the manufacturing performance of this churn. Details of a trial churing during this investigation were:—

Date—30th September, 1957

Butterfat of cream ..	40%
Cream load	987 gal. (86 boxes)
Churning temperature ..	47° F.
Churning time	41½ min.
Grain size	½ in.
Working times	15 min. and 7 min.
Moistures, first/final ..	15·4%/15·8%
Final butter temperature	52½° F.
Butterfat % of buttermilk	1.03%

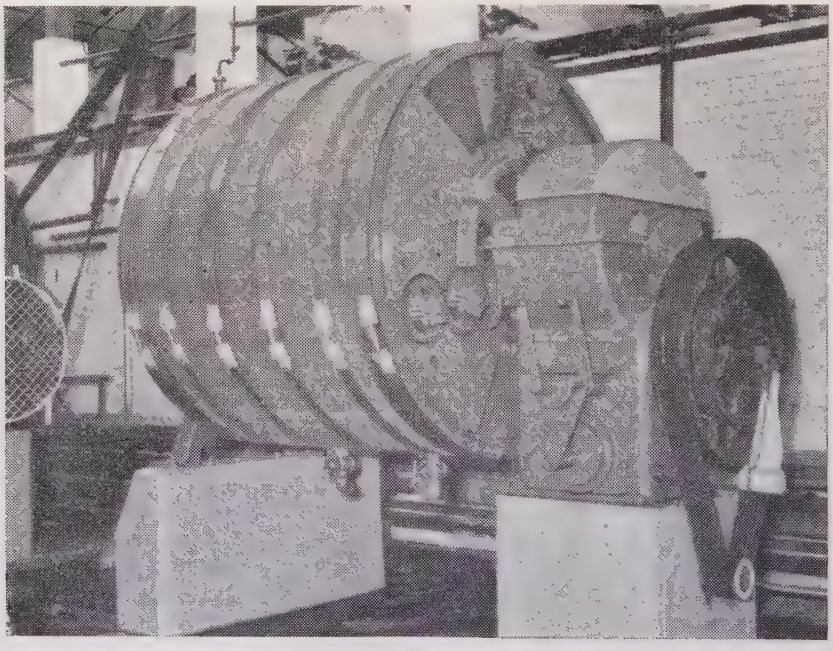


Plate 4.

Conventional James Bell Wooden Barrel. Compare with Plate 1.

(3) *Anderson* (uninsulated).—This unit is constructed of $\frac{3}{8}$-in. plate stainless steel with $\frac{7}{8}$-in. plate ends and is of the rollerless design. Churn loads approximate 100 boxes. The weight of this unit is less than the conventional wooden unit fabricated in teak, the weights being 4 tons 16 cwt. for metal and 5 tons 10 cwt. for teak.

No churns of this type are in operation in Australia, although an operational unit has been tested in New Zealand at Rangitaiki. Performance details indicate there is little difference in manufacturing operations in that country between the wooden and metal churns.

A modification has been made to the original unit to enable temperature control during manufacture if necessary.

(4) A further modification has been introduced in one type of barrel to assist with hygienic maintenance of butter churns. This is the replacement in wooden barrels of the conventional wooden workers (rollers) with their associated glands. In this type conventional workers have been replaced with a series of adjustable stainless steel tubes carried in nests in racks, the racks being adjustable for alignment. Six nests of tubes replace the four sets of workers in a 100-box churn.

There has been some doubt as to the efficiency of water distribution in butter with these churns during working. Tests done in New Zealand and Victoria indicate that moisture can be satisfactorily controlled. The results reported here were obtained from the Drouin butter factory, where the first churn of this type in Australia is in operation:—Five samples from 98-box load tested 15·84, 15·84, 15·87, 15·80, 15·80.

An additional feature of this new construction is the increased load obtainable (estimated at 10 per cent.) in the churn because of the increased volume of cream which can be run in for churning without overfilling.

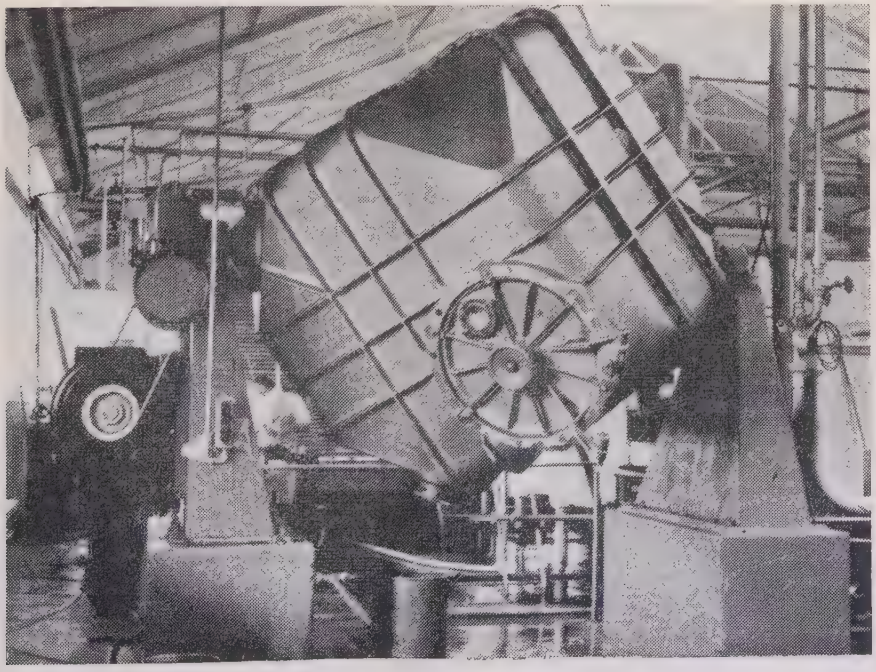


Plate 5.

Scott "Challenge" Cubical Aluminium Churn.

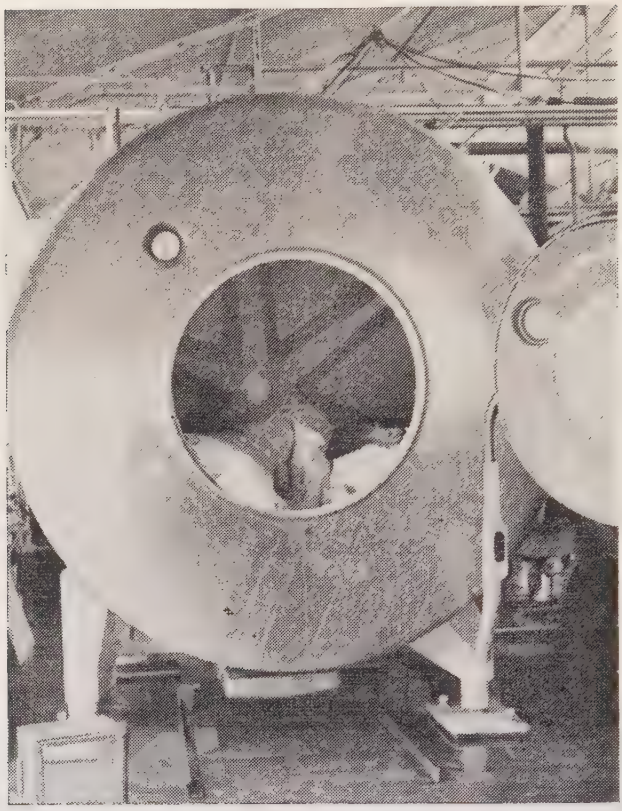


Plate 6.

Scott-Gosselin Barrel in Operation at Yarrum. Note raised cooling vanes attached to interior face of back plate.

A barrel of this type has been installed in the Rockhampton branch of the Port Curtis Co-operative Dairy Association.

FUTURE INSTALLATIONS.

This successful operation of the Kingston unit and the availability of large-capacity metal churns has ushered in a new era in factory operations. There are over 100 wooden churns still in use in Queensland and this provides a wide field for future development.

The availability of churns to fit existing equipment, the difficulty of providing timber of suitable quality for the fabrication of the traditional type of wooden unit, and the increased incidence of rot in existing barrels are all factors which will hasten the introduction of these metal churns.

In addition, increasing importance is being placed on the bacteriological condition of butter both locally and on the overseas market, and the advantage of metal churns in this regard has been demonstrated.

All these conditions lead to the conclusion that, having been found successful in operation, insulated metal churn barrels will become common items of equipment in the near future. With uninsulated churns, however, there is a need to determine their suitability under Queensland climatic conditions and whether some form of cooling (applied internally or externally) is required during operation.

Managing Dairy Heifers After Weaning

By C. H. CLARK, Adviser, Division of Dairying.

Correct management of heifers after weaning is very important. In Queensland it is usual practice to feed them on pasture only. But it has been shown in trials that the feed they get is often insufficient or too rank for young stock to grow well.

Winter and spring rainfall is so uncertain that good pasture is usually scarce during these seasons. Young stock do not develop fully on poor pasture, and maturity may be delayed for a long time.

When poorly developed heifers calve, their productive capacity is reduced, and their first lactation is frequently short.

This survey is based on information concerning the management and feeding of heifers. It was collected by Herd Recorders during 1955-56 and 1956-57 from 255 farmers who were recording their herds for production. The farmers were asked to give facts on the feeding and rearing practices used for their heifers, chiefly during the summer months of 1955 and 1956.

Treatment After Weaning.

The data revealed that, after calves were weaned, 76·1 per cent. of farmers put them in a paddock with the dry cows, and 23·9 per cent.

Plate 1.

Good Pastures Grow Good Heifers.

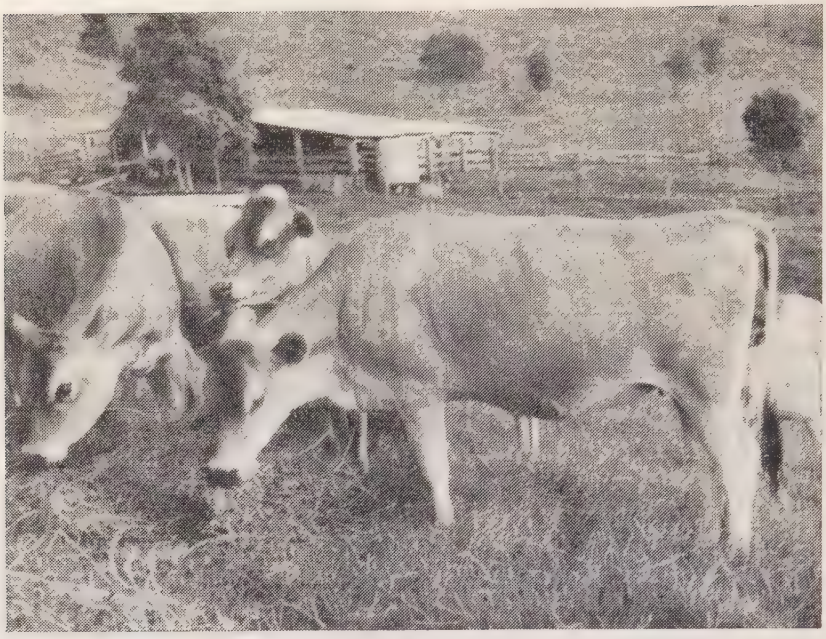


Plate 2.

Well Grown Heifers Feeding On Hay.

either ran them with the milking cows or put them into a separate paddock. Only 20·8 per cent. of all farmers included in the survey adopted a system of rotational grazing.

The ideal management of calves which have just been weaned would be to provide good pasture or crops for them or feed them concentrate daily until they are 1 year old.

When calves are weaned in winter and turned out with the dry cows they frequently lose weight and their development is retarded until spring or summer rains fall. This is because in "dry" paddocks the winter feed is usually too sparse and of too low nutritive value for young stock to thrive. By arranging for cows to calve during July to September, farmers would be able to wean their calves during the summer months, when pasture growth is at its best.

With regard to the feeding of supplements, the survey indicated that 12·9 per cent. of farmers regularly fed heifers with hay, chaff, grain or meal. Lucerne hay or chaff, or cereal grains, were the most popular supplements used. One in every four of the farmers either fed mineral supplements or placed licks in the paddocks where heifers were kept.

Mating of Heifers.

Approximately half of the farmers included in this survey ran a bull with the heifers. The majority of them (70·2 per cent.) kept the bull with the heifers all the year, while 4·6 per cent. confined the bull to a separate paddock during the summer months and 25·2 per cent. shut him up during the winter months. The mating of heifers was controlled by nearly half of the farmers. The average age of mating was 18 months, the range being from 10 to 30 months.

In herds where mating is controlled, the correct age of mating would be governed largely by the growth and

development of individual heifers. The pattern of calving must also be considered. If seasonal calving is practised the age of mating will be about 15 months.

Treatment Before Calving.

Most farmers (81·9 per cent.) brought their heifers to a paddock close to the bails a few weeks before they were due to calve. In many cases the heifers were run with the milking cows and trained to use the bails. Half of the farmers provided a change in the feeding of heifers just prior to calving. Some heifers were placed on better pasture, while others were given access to crops. Chaff, hay or grain was fed in some cases.

It is recommended that "Heifers be well fed—steamed up—for two or three months before calving. During early lactation the high-producing heifer cannot get enough food to meet the requirements of production and body growth for she has to put on 200–300 lb. liveweight. Before calving, therefore, the heifer must eat enough good food to store nutrient reserves in her body to supply this sudden demand." *

Management Aim.

The aim in the management of heifers should be to develop healthy, well-grown animals which will be capable of producing well when they join the milking herd.

The survey has shown that most farmers (76·1 per cent.) run their heifers with the dry cows. Few farmers provide supplements while the young stock are growing, and usually the heifers are not taken from the "dry" paddock until a few weeks before calving. The mating of heifers is controlled by about half the farmers included in this survey.

Post-weaning feeding and management of heifers are important as these factors influence productive ability during future years as milkers in the herd.

The need for improved heifer rearing practices is clearly evident from the survey.

* The Dairy Calf: Its Feeding and Management—A. Hutchings and G. I. Alexander—Q.A.J. Vol. 80, part 6, June, 1955.

Timely Hints

Sow Lucerne: Perhaps the outstanding lesson of the drought for the dairy farmer and those graziers in suitable localities, is that lucerne is the State's outstanding pasture legume.

The ability of lucerne to produce feed under conditions of severe stress and then to make spectacular recovery when relief rains eventually fall have been highlights of the past season.

Examples can be found in almost every district from Texas north to Rockhampton.

Stock owners who are interested in establishing sown pastures should consider including inoculated lucerne seed at about 1 lb. per acre. They should consult their local Advisory Officers about soil types and rainfall requirements.

—S. MARRIOTT, Chief Agrostologist.

Corn Pickers: Have you ever considered how fast the snapping rolls on a corn picker run? If not, then heed the warning of men who have timed them. The rolls run fast enough to carry a stick 12 ft. long through the rolls in one second. Don't flirt with disaster by attempting to clear clogged snapping rolls with a stick, cornstalk or ear of corn while the power is still on. Safety makes sense—stop the tractor and PTO before unclogging a corn picker.

—C. G. WRAGGE, Agricultural Engineer.

Tuberculosis-Free Cattle Herds. (As at 1st April, 1958.)

Aberdeen Angus.

G. H. & H. J. Crothers, "Moorenbah," Dirranbandi
A. G. Elliott, "Ooraine," Dirranbandi
W. H. C. Mayne, "Gibraltar," Texas

A.I.S.

M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
F. B. Sullivan, "Fermanagh," Pittsworth
D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
W. Henschell, "Yarranvale," Yarranlea
Con. O'Sullivan, "Navillus" Stud, Greenmount
H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy.
Sullivan Bros., "Valera" Stud, Pittsworth
Reushle Bros., "Reubydale" Stud, Ravensbourne
H. F. Marquardt, "Chelmer" Stud, Wondai
A. C. and O. R. Marquardt, "Cedar Valley," Wondai
A. H. Sokoll, "Sunny Crest" Stud, Wondai
W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
W. H. Thompson, "Alfa Vale," Nanango
S. R. Moore, Sunnyside, West Wooroolin
H.M. State Farm, Numinbah
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
D. G. Neale, "Grovely," Greenmount
A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
W. D. Davis, "Wamba" Stud, Chinchilla
Queensland Agricultural High School and College, Lawes
C. K. Roche, Freestone, Warwick
Mrs. K. Henry, Greenmount
D. B. Green, "Deloraine" Stud, Durong, Proston
E. Evans, Wootha, Maleny
T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
M. F. Power, "Barfield," Kapaldo
A. H. Webster, "Millievale," Derrymore
W. H. Sanderson, "Sunlit Farm," Mulgildie
R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, *via* Murgon
R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
C. A. Heading, "Wilga Plains," Maleny
G. S. and E. Mears, "Morden," M.S. 755, Toogoolawah

Ayrshire.

L. Holmes, "Benbecula," Yarranlea
J. N. Scott, "Auchen Eden," Camp Mountain
E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
T. F. Dunn, Alanbank, Gleneagle

Friesian.

C. H. Naumann, "Yarrabine" Stud, Yarraman
D. J. Pender, "Camelot," Lytton road, Lindum
S. E. G. Macdonald, "Freshfields," Marburg

Guernsey.

C. D. Holmes, "Springview," Yarraman
A. B. Fletcher, Cossart Vale, Boonah
W. H. Doss, Degilbo, *via* Biggenden
A. C. Swendson, Coolabunia, Box 26, Kingaroy
C. Scott, "Coralgrae," Din Din Road, Nanango
R. J. Wissemann, "Robnea," Headington Hill, Clifton
G. L. Johnson, "Old Cannindah," Monto
A. Ruge & Sons, Woowoonga, *via* Biggenden
G. Miller, Armagh Guernsey Stud, Armagh, M.S. 428, Grantham

Jersey.

Queensland Agricultural High School and College, Lawes
J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
J. F. Lau, "Rosallen" Jersey Stud, Goombungee
G. Harley, Hopewell, M.S. 189, Kingaroy
Toowoomba Mental Hospital, Willowburn
Farm Home for Boys, Westbrook
P. J. L. Bygrave, "The Craigan Farm," Aspley
R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
E. A. Matthews, "Yarradale," Yarraman
A. L. Semgreen, "Tecoma," Coolabunia
L. E. Meier, "Ardath" Stud, Boonah
A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
F. W. Verrall, "Coleburn," Walloon
C. Beckingham, Trouts road, Everton Park
W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
G. H. Ralph, "Ryecombe," Ravensbourne
Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
J. W. Carpenter, Flagstone Creek, Helidon
H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
W. S. Kirby, Tinana, Maryborough
S. A. Cramb, Bridge st., Wilsonton, *via* Toowoomba
J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
T. Nock, Dallarnil
P. Fowler & Sons, "Northlea," Coalstoun Lakes
F. Porter, Conondale
H.M. State Farm, Palen Creek
B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie

Poll Hereford.

W. Maller, "Boreview," Pickanjinnie
J. H. Anderson, "Inverary," Yandilla
D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick.
E. W. G. McCamley, Eulogie Park, Dululu
Wilson and McDouall, Calliope Station, Calliope

Poll Shorthorn.

W. Leonard & Sons, Welltown, Goondiwindi.

A Useful Milk Can Lid

By H. G. DOUGHERTY, Dairy Officer.

We all know that milk from a cow "fresh in" cannot be used for separating. We also know that extra time is taken up milking freshly calved cows by hand. This work, however, can be made easy. By using a "bucket" on the machine, fresh cows may be milked out and the milk kept separate from that in the vat.

To do this only a can lid, a rubber seal, and two piece of $\frac{5}{8}$ in. down dropper piping are needed.

To make the bucket, take the can lid and drill two $\frac{5}{8}$ in. holes opposite each other on the top. Solder a piece of the dropper pipe, about 3 in. long, into one of the holes leaving approximately $1\frac{1}{2}$ in. inside and outside. A short piece about $1\frac{1}{2}$ in. long is then soldered into the second hole. This need not protrude inside the lid. A rubber ring, used on some milking machines, will make a suitable seal. Once this lid has been made it may be used on any suitable "spare" can in the dairy.

Assembling the "bucket" for use is simple. Firstly fit the lid with the seal onto the can. Then disconnect the milk rubber from the metal down dropper and connect it to the pipe on the lid, which extends inside the can. Another milk rubber from your reserve stocks is then used to connect the down dropper pipe on to the other pipe fitted on the lid.

The "bucket" is now ready for use. When the tap is turned on and the cups placed on the cow, the milk will be drawn through the first milk rubber and deposited in the can.

Consider the Vacuum.

The effect of the vacuum conditions on the can structure requires some consideration. If the lid is fitted to a large capacity can, it would be advisable to solder a cross made from 1 in. by $\frac{1}{8}$ in. flat iron, to the bottom of the can on the outside. The arms of the cross should extend to the rim of the can and be curved to fit closely to the bottom of it. This will strengthen the bottom of the can and prevent any "buckling" and subsequent cracking of the metal.

If you convert a spare can lid in this manner you will find it useful in other ways. If you save "house" milk from a selected cow she need not be milked by hand. The lid may be used to check a special cow in your herd if you wish to record her production. If you are feeding concentrates you can use the can to find out whether the feeding is worth while.

In this manner an old, though sound, lid may easily and very cheaply be turned into a useful article.

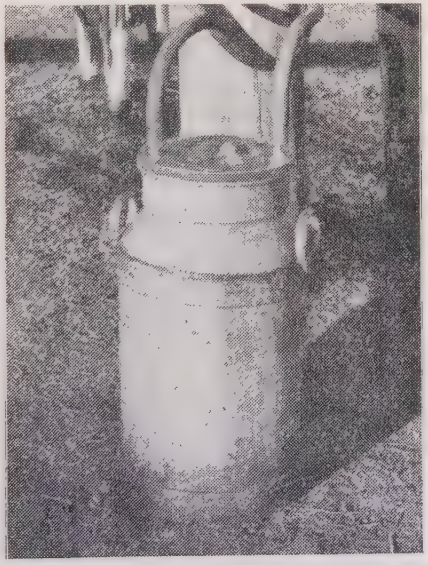


Plate 1.

Milk Can, Showing Lid in Place, and Attached to Milking Machine.

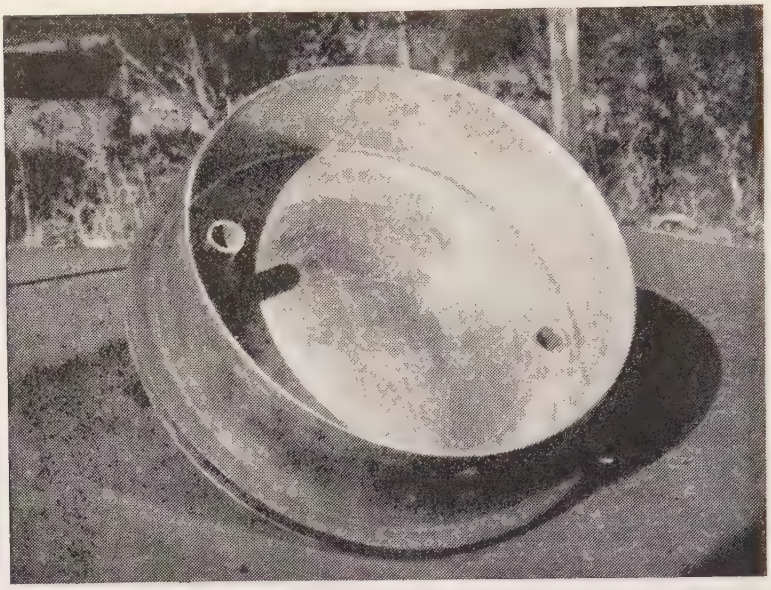


Plate 2.
Inside of Lid, Revealing the Two Pipe Fittings.

Grasses and Legumes

Question: "D. R." of Gin Gin has written inquiring about publications on native and introduced species of grasses and legumes growing in Australia. He has inquired, too, about Biloela buffel grass.

Answer: Unfortunately there is not available any single publication dealing with this group of plants. Probably the most suitable book is "Dairy Farming in Australia—Queensland Edition". This book is available free to all dairymen and costs 7s. 10d. to others. It is obtainable from the Department of Primary Industries, Commonwealth Building, Adelaide Street, Brisbane.

The book contains a section on pasture management and some notes on various pasture species.

The Agriculture Department can supply pamphlets on several grass species, these being available free of cost on application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane, or from the local Adviser in Agriculture.

Biloela Buffel Grass.

Biloela buffel grass is a more vigorous, and heavier yielding variety than any of the other commercial varieties of buffel.

It can grow somewhat coarse and may have a lower percentage of leaf than Gayndah buffel. In some districts at least it is less palatable, while at certain stages of growth it appears to have a slightly lower protein content. However it is a valuable perennial pasture grass which has shown real promise in many parts of Queensland.

—Agriculture Branch.

Milk Test Can Show Farmers Way To Higher Price

By T. A. MORRIS, Dairy Technologist.

A farmer supplying to a cheese factory should know that milk failing to pass the methylene blue test is generally not clean or was not cooled after it came from the cow.

Knowing this, he should be able to take remedial action and so benefit by amended grading regulations that provide a higher price for first grade milk.

Recent amendments to the Dairy Produce Acts make compulsory the grading of milk supplies to cheese factories and the payment of a price differential according to grade.

All milk supplies to cheese factories must be graded by the senses test and each supply must be subjected to the methylene blue grading test at least five times during each week.

The new Regulation 158A sets out the following standards for milk grading at cheese factories:

"First Grade Milk" means—

(1) Milk free from undesirable taints, colostrum, or foreign substance, matter, or thing as determined by the senses test; and

(2) which is capable of being made into cheese of a grade not lower than first grade; and

(3) which when tested by the methylene blue test shall not decolourise the dye used in such test in less than 1½ hours during October to March inclusive, nor in less than three hours during April to September, inclusive.

"Second Grade Milk" means—

(1) Milk free from serious taints or any foreign substance, matter or thing which, as determined by the senses test, renders the milk unfit for the manufacture of a product for human consumption; or

(2) Milk which, when tested by the methylene blue test, shall decolourise the dye used in such test in less than 1½ hours during the months of October to March inclusive or in less than three hours during the months of April to September, inclusive.

METHYLENE BLUE TEST.

Equipment.

The following equipment is required for the carrying out of the methylene blue test:

(*a*) Sampling dippers. For convenience it is advisable to have at least two sampling dippers. If test tubes are not marked at the 10 ml. level accurate 10 ml. sampling dippers are useful.

(*b*) Test tubes. An adequate supply of 6 inch x ⅝ inch test tubes accurately marked at the 10 ml. level.

(*c*) Rubber stoppers or seals to fit the test tubes.

(*d*) Burette. A burette with 1 ml. graduations or an "automatic" burette dispensing 1 ml. at each opening of the tap (1 ml. pipettes may be used but are not so convenient). A glass funnel for filling the burette is desirable.

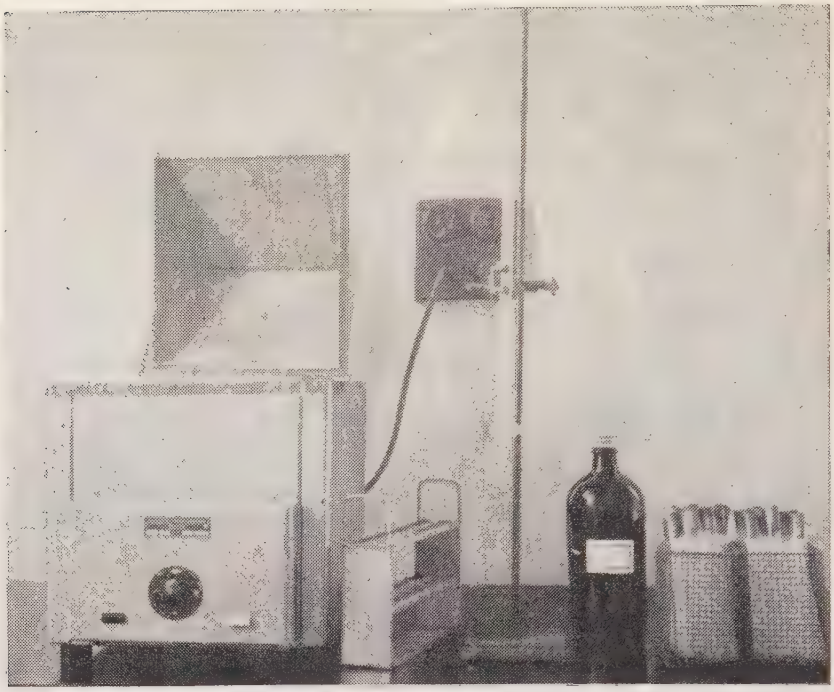


Plate 1.

Equipment Used for Conducting Methylene Blue Tests. A thermostatically controlled water-bath with removable test tube racks, a burette, a bottle of methylene blue solution and baskets of rubber-stoppered test tubes are shown.

(*e*) Water bath. An electrically heated water bath with thermostatic temperature control operating at 37 deg.-38 deg. C. (98-100 deg. F.) fitted with a close fitting cover and a thermometer and equipped with removable racks suitable for holding the test tubes. If electricity is not available the bath may be heated by means of a spirit lamp. Temperature control is then achieved by manipulation of the flame of the lamp.

(*f*) Methylene blue solution. A supply of standard methylene blue tablets is required for the preparation of the methylene blue solution as described below.

(*g*) Measuring cylinders and flasks. Graduated measuring cylinders of 1,000 ml. capacity and 1,000 ml. flasks of the type used for starter Mother Cultures. The flasks require rubber bungs when blue solution is being stored in them and they should be wrapped in brown paper to exclude light if they cannot be stored in a dark cupboard. Suitable brown bottles can be used instead of flasks.

(*h*) Wire baskets or other suitable containers for holding the tubes and stoppers during sterilizing.

(*i*) A clockwork automatic interval timer is very convenient for timing the half-hour periods of the test.

Milk Sampling.

The supply of milk being sampled must be well mixed in the weigh-vat before the sample is withdrawn. At least two sampling dippers should be used alternatively and should be left in water at a temperature not less than 160 deg. F. between uses in order to prevent contamination of one

milk sample by the residue, in the dipper, of the previous milk sample.

An amount of 10 ml. of milk is placed in the test tube corresponding in identity to the supplier of the milk which is being weighed. If more than one weighing is necessary the 10 ml. sample should be a proportionate composite sample.

If any great length of time is to elapse before the samples are placed under test they should be kept in a refrigerator or cold room.

Conducting a Test.

(*a*) Using a sterilized burette or pipette, add 1 ml. of blue solution to each sample of milk.

Note—If a pipette is used, pour the day's requirements of blue solution into sterilized test tubes or other suitable sterile container. Do not repeatedly dip the pipette into the storage bottle of solution and do not return any unused solution to the bottle. Such practices may lead to contamination of the bulk solution.

(*b*) Insert a sterilized rubber stopper in each tube and slowly invert the tubes once or twice to mix in the blue.

(*c*) Place the racks of tubes in the water bath with the temperature maintained at 37 deg. C. (98 deg. F.). Set the 30-minute timer or note the time.

(There should not be any undue delay in completing the three steps, once commenced.)

(*d*) Examine the tubes at each *half-hour* interval and note any which are decolourised, then invert the tubes once and return to the bath. (The time taken to the half-hour at which decolourisation is first noted is recorded as the result of the test. A tube of plain milk without dye added may be found useful for comparison with the colour of the tests.)

Preparation of Methylene Blue Solution.

Unless manufacturer's directions in regard to the quantity of water used are to the contrary, the following procedure may be followed for preparing the methylene blue solution.

(*a*) Measure out 800 ml. of clean rain water in a measuring cylinder.

(*b*) Transfer about 200 ml. of the water to a 1,000 ml. flask.

(*c*) Add one methylene blue tablet to the water in the flask and shake until the tablet is completely dissolved.

(*d*) Add the remainder of the 800 ml. of water to the flask, insert a cotton-wool plug, place in a steamer and steam for 1 hour.

(*e*) After steaming the blue solution, remove the cotton-wool plug and insert a sterilized rubber bung before storing the flask of solution in a cool, dark position.

Daily Sterilizing of Equipment.

The test tubes and the methylene blue burette and funnel or pipettes must be sterilized before use. This may be done by steaming them thoroughly in a steamer for at least 10 minutes.

Rubber stoppers for the tubes must also be sterilized and this may be done by boiling in water for 10 minutes.

Recording Weights.

Unless a milk supply is graded below first grade by the senses test, it will not be known for certain what grade is to be given to the milk until the results of the methylene blue test are available. Therefore, at weighing-in, only the weight will be recorded for milk not graded below first by the senses test. At some later time, when the methylene blue results have been obtained, a milk receival book, drawn up as shown in the new Form 64 in the Schedule to the Dairy Produce Regulations, may be filled in.

From the receival book it will be seen that at the end of each testing period there may be two total weights of milk from each supplier, one being that of first grade milk and the other that of second grade milk.

The one butterfat test obtained from the one composite sample is applied to both weights of milk to give the two weights of butterfat for which the supplier is to be paid.

When a supply of milk is graded below first grade it will be necessary to send the supplier notice to this effect as set out in the new Form 75A.

DETERMINING PAYMENT.

The price paid to suppliers for second grade butterfat must be at least 2d. per lb. less than the price paid for first grade butterfat. Thus if it is decided to pay 4s. 3d. per pound for first grade butterfat, the price for second grade butterfat must not be more than 4s. 1d.

Applying these rates of pay in the sample section of a milk receival book (Table 2), the supplier S. Loe would be credited for the period concerned as follows:—

	£	s.	d.
29.2 lb. of 1st Grade butterfat at 4s. 3d. per lb. =	6	4	1
31.6 lb. of 2nd Grade butterfat at 4s. 1d. per lb. =	6	9	0
Total	£12	13	1

In determining the monthly rate of pay it might be decided to take into account the proportion of first grade butterfat to second grade butterfat and so strike rates of pay which will involve the paying to suppliers of all money available.

However, if the Company rules permit, a very useful fund could perhaps be built up of the money retained as the differential for second grade butterfat, and this fund might then be applied to the purchase of new factory equipment and the general maintenance of the factory.

This latter procedure would make the differential fully effective and would allow for improvement in factory buildings and equipment.

PRODUCING MILK TO PASS THE TEST.

It is easier to produce milk which has a long methylene blue time when it is fully realised what causes a short blue reduction time. The time taken for the reduction of the blue is dependent mainly on the numbers and types of bacteria present in the milk when it is tested. The greater the number of bacteria present, particularly if they are of a certain type, the shorter will be the reduction time.

The types of bacteria which most rapidly reduce the methylene blue probably originate from manure-dust, dirt and hay. But wherever they come from in the first place they can grow to very large numbers on any milk-soiled equipment such as buckets, milking machines, vats, coolers and cans. Even bail-posts, door handles and stools that are handled with milky hands or splashed with milk can provide a home for these bacteria.

Milking machines or any utensils that are left in a milk-soiled condition soon develop a bacterial population of many millions. Immediately after milking, thorough washing followed by sterilizing with boiling water, and the use of a chlorine rinse just before milking, are necessary to avoid large numbers of bacteria occurring in the the milk.

The number of bacteria in the milk when a sample is taken for a methylene blue test depends mainly on two factors:—

(1) The number of bacteria gaining entry to the milk during, or after, milking.

(2) The temperature and length of storage.

Milk in a healthy cow's udder is fairly free from bacteria, though it does pick up some through the teat-canal and the larger milk-ducts. By

far the majority of the bacteria in milk which gives a short methylene blue reduction time will therefore have been added to the milk during or after milking. This may have occurred in a number of ways, such as the use of unclean milking machines, buckets or cans, or their contamination by wind-blown manure-dust, or by dirt from the cow's teats and udders, and by flies.

These bacteria grow very rapidly in warm milk and a few hundred may become millions by the time the milk is tested if it is not cooled and kept cool. With clean milk for cheese-making purposes, cooling to below 70 deg. F. usually gives fairly satisfactory results when the milk is held only overnight. Of course, cooling below 50 deg. F., such as is achieved by refrigeration, is even better.

The effect on the methylene blue test produced by the cooling of milk has been shown in trials in which farmers cooled their milk for two milkings but, without changing their cleaning techniques, did not cool the milk for the next two milkings. Table 1 shows a few typical results obtained.

TABLE 1.

COMPARISON OF METHYLENE BLUE REDUCTION TIMES FOR COOLED AND UNCOOLED MILK SUPPLIES FROM PARTICULAR FARMS.

Farm.	Methylene Blue Reduction Times (hr.).			
	Milk Tower-water Cooled.	Milk Uncooled.	Milk Refrigerated.	Milk Uncooled.
A	3½	1½	..	..
A	2½	1	..	..
B	3	2	..	..
B	3	1½	..	..
C	..	..	5½	1½
C	..	..	6	2
D	..	..	6+	2½
D	..	..	6+	2

TABLE 2.

MILK RECEIVAL BOOK.

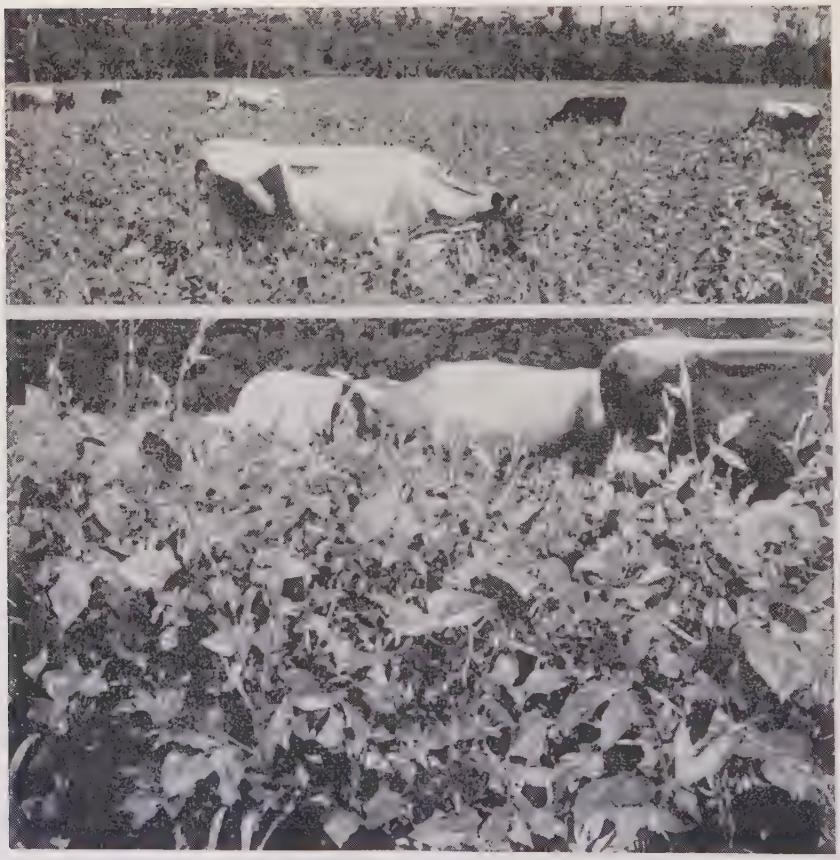
.....Factory .....Period Ending.....19 .

No.	Name.	Milk Received (lb.) and Date.														Total Milk.		Butter Fat.		
		1.		2.		3.		4.		5.		6.		7.		8.		Lb.		Test.	Lb.	
		1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	1 Gr.	2 Gr.	%	1 Gr.	2 Gr.
9	S. Loe ..	180	..	..	200	190	..	180	..	..	200	..	200	180	..	..	190	730	790	4·0	29·2	31·6
10	J. Yass ..	..	180	..	200	180	..	..	170	..	200	..	180	..	190	..	170	180	1,290	3·8	6·84	49·02
11	M. Manning ..	400	200	500	350	500	200	450	200	370	400	250	500	450	350	460	400	3,380	2,600	4·0	135·2	104
12	J. Nara ..	..	700	300	350	400	250	800	..	650	150	400	250	500	350	450	400	3,500	2,450	4·0	140	98
13	L. Lanney ..	700	..	350	300	250	400	..	800	150	650	250	400	350	500	400	450	2,450	3,500	4·0	98	140
	Daily Totals	1,280	1,080	1,150	1,400	1,520	850	1,430	1,170	1,170	1,600	900	1,530	1,480	1,390	1,310	1,610	10,240	10,630			

Summing up, it can be said that a short methylene blue reduction time is generally an indication of a lack of cleanliness in the production and handling of the milk or failure to cool it as soon as it is obtained from the cows.

Farmers who experience a short methylene blue reduction time with their milk should critically examine their cleaning and sterilizing methods and the efficiency of their milk-cooling systems. If the reason for the poor quality of the milk cannot be readily found and the problem overcome, they should seek the advice of their local Dairy Officer.

Protein for Production



Legumes Such As These Cowpeas Provide the Protein for Production.

Apple Growers Favour Three Varieties

By M. A. HANNIGAN, Senior Adviser in Horticulture.

Trends suggest that apple growers in the Granite Belt aim at establishing orchards consisting mainly of Delicious, Granny Smith, and Jonathan varieties.

Further heavy plantings of Delicious can be expected.

The pioneers of apple growing in the Stanthorpe district planted a few trees of each of the better known varieties in the 1920's. Since then, those that proved unsuitable for commercial purposes have been either replaced by, or re-worked to, more popular types.

The change is indicated in Table 1.

TABLE 1.

PRODUCTION VOLUME 1940/41 AND 1956/57.

Varieties.	1940–41.		1956–57.	
	Bushels	%	Bushels	%
Granny Smith	86,000	33	324,000	39
Delicious ..	26,400	12	283,000	34
Jonathan ..	52,800	23	97,000	16
Gravenstein ..	21,600	9	56,000	6
Others ..	52,800	23	48,000	5

It will be noticed that in 1956-57 the production of Granny Smith and Delicious apples each far exceeded that of all other varieties, and that the four main varieties comprised 95 per cent. of the total production for the district. The most spectacular increase occurred in Delicious, mostly at the expense of varieties such as Munro's Favourite, Lord Nelson, Twenty Ounce and Rome Beauty.

The Granny Smith is an outstanding dual purpose eating and cooking apple, while Delicious is the premier dessert apple. Both keep well in cold store and this, by opening up markets for the fruit, has probably influenced growers to extend their plantings in recent years.

Storage Qualities Accented.

The first cold store to handle apples at Stanthorpe was built in 1935 when export of apples overseas in commercial quantities began. This development in the industry focussed grower attention on varieties which, besides being suitable for eating and cooking, possessed good storage and carrying qualities. As a result, the Granny Smith soon outstripped its competitors.

Since 1935 cold storage space in the district has increased steadily, and expansion has been very pronounced in the past decade. In 1957, there was storage space for 250,000 bushels, and a further two stores now being built will hold an additional 50,000 bushels.

Plantings After the War.

The increasing popularity of the Delicious variety in recent plantings is indicated in Table 2.

TABLE 2.

AREA UNDER VARIETIES (PER CENT.).

Varieties.	Area Under Crop 1935.	Plantings 1947–57.
Granny Smith	36%	37%
Delicious ..	11%	38%
Jonathan ..	22%	13%
Gravenstein ..	9%	7%
Others ..	22%	5%

Plantings of young trees were exceptionally heavy after the war and this trend seems likely to continue, though possibly at a somewhat slower

Plate 1.

Re-worked Apple Tree—Each year, large numbers of apple trees are re-worked to more popular varieties such as Granny Smith and Delicious. Strap grafts and side grafts are shown.

pace. During the last 11 years, some 501,539 trees were established, and the area under apples (10,055 acres) in the Stanthorpe district is now almost double what it was in 1940. An estimate of 1,000,000 bushels for the 1960 crop is not considered excessive.

From 1947 to 1952, plantings of Granny Smith exceeded those of Delicious, but from 1953 onward Delicious plantings exceeded those of Granny Smith by 15,000 trees. Jonathan retained its position as the third most popular variety during the same period.

These trends suggest that growers aim at establishing commercial orchards consisting mainly of these three varieties.

As a result of the increased plantings of mid-season varieties such as Jonathan and Delicious, and the late season variety Granny Smith, supplies of early red dessert apples have decreased in recent years. Consequently, prices for this type of fruit have increased.

A good quality, early red apple is needed by the industry, and it is hoped that Early Red McIntosh, a comparatively new variety, will meet requirements. From 1952 to 1957, nearly 5,000 trees of this variety were planted.

Williams' Favourite holds second preference at Stanthorpe as an early variety; 3,912 trees of this variety have been planted since the end of the war. Gravenstein, even though it has the bad fault of "gnarling," is still being planted extensively as an early cooker and second early dessert apple. From 1947 to 1957, 30,308 Gravensteins and 4,233 trees of its bud sport, Red Gravenstein, were established.

McIntosh Red, Red Statesman, Stayman's Winesap and Dougherty are useful mid-season and late-season red varieties of apple, the combined plantings of which over the last 11 years were 16,059 trees. Small plantings (about 900 trees) of the new late red variety, Legana, have been made in the district during the last five years.

Varieties which are now out of favour include the two early cookers, Twenty Ounce and Lord Nelson, and the mid-season varieties, Munro's Favourite and Rome Beauty.

Trend Towards Delicious.

With the heavy plantings of Granny Smith before the war and during the post-war period, there seemed a possibility that production of this variety might soon exceed market requirements. As Delicious—one of the best dessert varieties grown in the Granite Belt—is also a suitable pollinator for Granny Smith, growers used to order Granny Smith and nominate Delicious as a second choice if trees of the former variety were not available from nurseries. From 1950 onwards, the trend has been to order Delicious as the first choice and to nominate Granny Smiths as a second preference. In 1956, the number of Delicious trees planted exceeded Granny Smith by approximately 4,000.

Plate 2.

Apple Orchard in Winter Before Pruning.

Plate 3.

Young Apple Tree After Planting—Young trees are characteristic of the Stanthorpe district where the area under crop has doubled in the past 15 years.

What Makes Delicious Popular.

Any discussion of the Delicious apple must include its red strain—Lalla. The main difference between them is the colour of the fruit. Delicious has red stripes over a yellow ground colour although, if well grown, most of the fruit is red all over the surface. The Lalla apple, which has a deep red colour all over the surface, has increased in popularity during the last 11 years. During that period 35,188 trees were planted as compared with 155,742 of the ordinary Delicious.

The Delicious apple has a delightful flavour and satisfactory storage quality if harvested at the right stage of maturity. If the fruit is harvested too early, its flavour is rather tart, and if the fruit is harvested too late, the texture of the flesh is mealy. The storage life of fruit picked in late February and early March, although not so long as that of Granny Smith, is satisfactory and extends from five to six months.

For flavour, size and attractive fruit colour, the Delicious apple is outstanding. Prices realised on the local and interstate markets in 1957 were higher than those of most other varieties. Early in the season, the fruit realised, on an average, about 35s. a bushel case and, during the winter months, fruit ex cold store sold at 45s. to 60s. a bushel case.

Further heavy plantings of Delicious can be expected. No other variety is likely to displace it as the best mid-season dessert apple for the Granite Belt.

Grow Early Papaws With Irrigation

By G. W. J. AGNEW, Senior Experimentalist.

Although it is not usual to water the papaw crop, irrigation is practised by some growers, particularly in near-metropolitan districts, with satisfactory results.

Recent work at the Maroochy Experiment Station shows that irrigation during the dry spring months tends to induce flowering in early summer and to increase the amount of fruit that can be picked before the onset of cool weather in the following winter.

The growth response of the papaw to climatic changes during the year is greater in southern Queensland than in northern parts of the State where temperatures are higher. This is to be expected from a tropical plant.

In southern districts, papaw plants grown from seed sown in mid-summer develop rapidly so long as summer temperatures prevail and soil moisture remains at a high level. However, the growth rate declines with the approach of winter. This is indicated by the fact that, in January and February, the tree throws an average of four leaves per week whereas, in May, only one new leaf is produced each week.

These differences in growth rates are reflected in old trees by the "winter" constrictions on the trunk where the internodes are short and leaf scars are crowded together.

The young tree normally passes through a difficult period from July to October. At that time of the year, many of the lower leaves fall, growth is very slow and the trees have a shabby appearance. August and September are usually cold, windy months with little or no rain.

Rising temperatures in October and the onset of storm rains in November produce conditions more favourable for growth. New leaves are produced freely and, usually, the trees begin to flower in late November or early December. In normal seasons, the rate of flower production increases to a peak some time between mid-January and early March of the following year and then continues at a slower rate until late June or July.

With male-female strains of the papaw—the types normally grown in southern Queensland—the flowers produced in November and December mature their fruit between late May and August. Flowers produced after the end of December usually mature their fruit between September and November. Variations in times of fruit maturity are, however, not uncommon; they are due to differences in pollination, the incidence of ripe fruit rots and climatic conditions as the fruit develops.

Spring Rain Gives More Fruit.

When the summer flowering season is preceded by a dry spring, little or no fruit matures in non-irrigated papaws before winter and the heaviest picks are made in the following October. However, in years when good rains fall in spring, flowering commences early and pre-winter harvests are above average, the fruit being of excellent quality. As irrigation is a practical method of reproducing conditions comparable to those associated with spring rains, the effect of irrigation on cropping in the papaw plant has been investigated at the Maroochy Experiment Station.

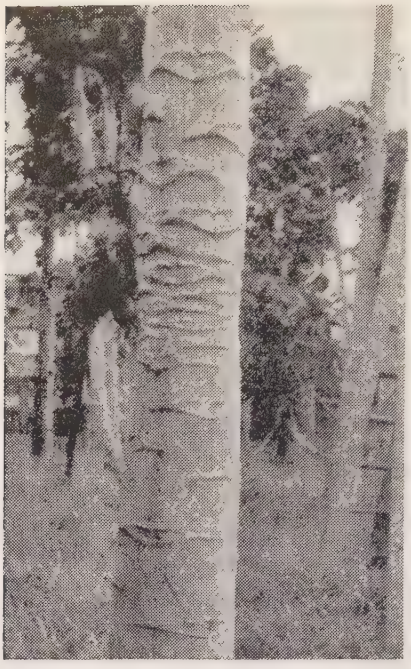


Plate 1.

Papaw Trunk Showing Winter Constriction. Low temperatures in winter slow down the growth rate of the plant and produce the constriction.

In February, 1955, young papaw trees were planted at an 8 x 8 feet spacing and, in a number of plots, irrigated 5 times between August and December at a rate of 2 inches per application. In the non-irrigated plots soil moisture fell to critically low levels in August and September. From October onwards, following good seasonal rains, soil moisture was more or less adequate for normal growth in both irrigated and non-irrigated areas.

In this trial, irrigation advanced the commencement of flowering by one month and, at the end of November, 1955, there were nearly four times as many trees flowering in the irrigated plots as in the non-irrigated plots. Consequently, the amount of fruit harvested between April and June, 1956, was increased by 80 per cent. —equivalent to 1½ tons an acre.

In spring 1956, however, production from the irrigated plots showed a decline as compared with that in non-irrigated plots. This decline in production was particularly marked in October, which is the normal peak harvest month. As flowers opening in February should mature their fruit in October, it would appear that when, as in irrigated plots, the trees are carrying a crop of fruit, flowering and fruit setting is reduced.

Irrigation Lengthens Harvest.

One effect of irrigation is to spread the harvesting period of the papaw crop. This tends to increase returns per acre to the grower for he is able to place a greater proportion of his crop on the market between April and June, when good papaws are relatively scarce and prices are often in the seller's favour. Incidentally, the quality of the fruit maturing at this time of the year in southern Queensland is appreciably better than that harvested from August to

Plate 2.

Ripe Fruit Rot in Papaws. Irrigation tends to spread the crop and reduce the wastage caused by the disease.

October. It is comparable in appearance and flesh quality with the best fruit from northern and central Queensland.

In the Maroochy district, losses from ripe fruit rots are at a maximum during the normal peak harvest in spring. A reduction in these losses can be expected in irrigated crops, which are normally harvested over a longer period.

In most papaw-growing districts, irrigation during the dry spring months is unquestionably beneficial. Not a great amount of water is needed; two inches of water (equal to 45,244 gallons an acre) applied each month during August, September and probably October should be sufficient to produce an autumn and early winter crop of papaws which will find an attractive outlet on the fresh fruit market.

DON'T PULVERISE YOUR SOIL!

The recent rains have enhanced the winter crop prospects, particularly on the Darling Downs, and large areas are now approaching the final stages of the fallow.

The soil crumbs have been reduced in size and could present an erosion hazard in the event of excessive winter rains.

Don't be in a hurry to prepare a fine seedbed. Trials have shown that you will obtain equally satisfactory results from a coarse fallow. Harrows tend to break down the soil crumbs—so use your harrows less, and reduce your erosion risk.

—J. E. LADEWIG, Chief Soil Conservationist.

Brucellosis-Tested Swine Herds

(As at 1st April, 1958.)

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
B. Osborne and Dr. J. W. Best, Miltown Stud Piggery, Warwick
W. Young, Kybong, via Gympie
H. H. Sellars, "Allambie" Stud, Tabooba, Beaudesert
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
D. Ludwig, Cainable, via Beaudesert
J. & S. Kahler, East Nanango

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
O. B. Vidler, Manneum, Kingaroy
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
B. F. Jensen, Rosevale
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
P. F. Ives, Capalaba
D. Ludwig, Cainable, via Beaudesert
J. C. Lees, "Bridge View" Stud, Yandina

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
R. A. Collings, "Rutholme" Stud, Waterford

British Black.

E. Pointon, Goomburra

If Your Tomatoes Lack Magnesium

By S. E. STEPHENS, Horticulturist.

When tomato plants suffer from a deficiency of magnesium the fruit is virtually unmarketable and therefore a total loss.

Tomato growers may remedy the deficiency by applying either dolomite or magnesium sulphate.

In areas where the rainfall is high and the soils are porous, soluble salts are leached out of the soil fairly rapidly in cultivated land. The loss of plant foods which occurs in this way is particularly marked in districts where vegetables are grown in quick succession. It is only to be expected, therefore, that deficiency disorders should appear unless steps are taken to make good the wastage of nutrients.

Loss of nitrogen by leaching is widely recognised by vegetable growers, and fertilizer programmes are designed to correct it. The symptoms—stunting of the plant and yellowing of the leaves—are, however, much less spectacular than those associated with a deficiency of magnesium brought about in the same way. Abnormalities in plant growth due to lack of magnesium are likely to occur in the better-drained soils of the wet tropics where the annual rainfall is more than 70 in. and, in some areas, exceeds 100 in.

Magnesium is present in the soil as magnesium carbonate as well as in a variety of complex compounds. It passes into solution from the carbonate and is therefore easily lost as water percolates through the soil.

WHOLE PLANT UPSET.

Many vegetable crops are susceptible to a deficiency of magnesium.

Plate 1.

Trellised Tomatoes—High Yielding crops must get adequate amounts of magnesium from the soil.

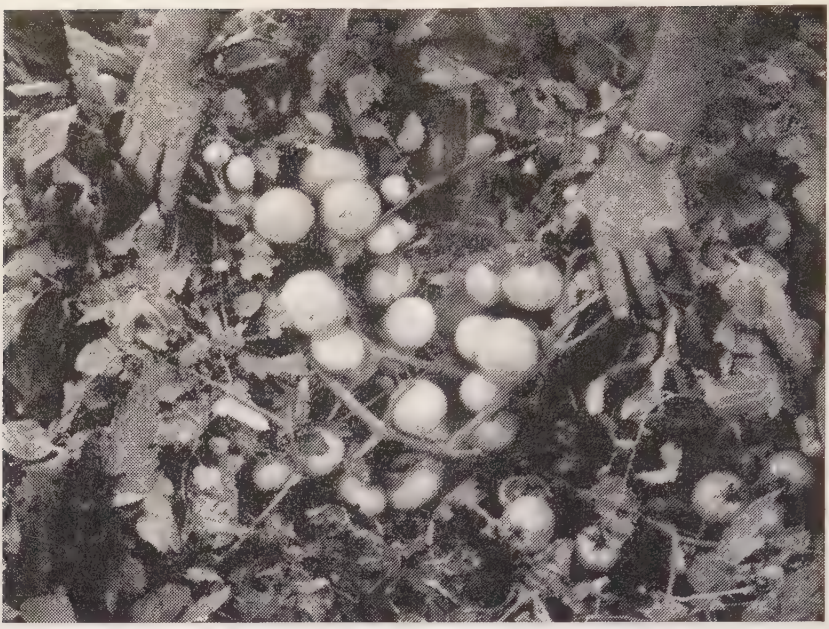


Plate 2.

Tomato Plant Opened Up to Show the Fruit—Look out for persistent green colour on the shoulders of the ripening fruit; it's a symptom of magnesium deficiency.

This element is a constituent of chlorophyll, the green colouring matter of plants, which uses the energy of light to manufacture carbohydrates such as sugars and starches in the tissues. A deficiency therefore upsets the whole functioning of the plant.

Unlike some other elements such as iron, magnesium moves easily through the plant tissues. If the magnesium taken up through the roots is not sufficient to meet the requirements of the young, rapidly-expanding leaves, the shortage is made good from supplies in the old leaves. As a result, symptoms of a deficiency are first noticed in the older foliage and extend later to the younger leaves.

WHAT TO LOOK FOR.

Tomato plants are very susceptible to a deficiency of magnesium in the soil and show very pronounced symptoms. In the early stages, the old leaves of plants which have commenced to flower and bear fruit lose the normal green colouration between the veins. The green veins then stand out very vividly against the yellow background of the leaf itself. In addition, the leaves tend to "roll" in at the margin. Later, patches of yellow tissue in the leaves die and finally the leaves wither and fall from the plant.

As the plants age and the deficiency becomes more acute, mottling symptoms appear progressively on more and more leaves. The rate of production of new growth slows down and finally ceases. By this time, most of the older leaves have usually browned-off, dried out and fallen from the plant.

The fruit also is affected, the typical symptom being a persistent green colouration on the shoulders of otherwise fully coloured fruit. Such fruit is, of course, virtually unmarketable and therefore a total loss to the grower.

HOW TO SUPPLY MAGNESIUM.

Magnesium-deficient soils are invariably highly acid and correction of acidity and supplying magnesium therefore go hand in hand. Perhaps the most common procedure is to replace the lime normally used for correcting excess acidity by dolomite, a ground mineral containing both calcium carbonate and magnesium carbonate. In southern Queensland and other areas where ground limestone and dolomite are competitively priced, this is a relatively simple matter; dolomite is substituted for ground limestone in the normal dressing applied at the rate of about 1 ton per acre every second or third year.

In North Queensland, where dolomite is not available locally, and must be obtained from the south at a comparatively high price, it is more usual to correct magnesium deficiency with magnesium sulphate applied either as a foliage spray to the affected plants or in the crystalline form to the soil.

On crops such as the tomato, the foliage spray is preferred. A 2 per cent. solution of magnesium sulphate (commonly known as Epsom salts) may be prepared by adding 8 lb. of the crystals to 40 gal. of water or, if only small quantities are required, by adding 12 oz. to each knapsack spray (equivalent to 3½ gal.). A little detergent should be added to the solution to promote thorough wetting of the leaves when the spray is applied to the plants. Treatment will, of course, quickly correct deficiency symptoms when they appear in the crop.

It should be remembered, however, that plant growth will have been affected long before gross symptoms of the disorder appear in the crop. Tomatoes treated after the appearance of the typical symptoms always produce lower yields than tomatoes grown under the same set of conditions with ample supplies of magnesium during the whole growing period. On land where deficiency symptoms have been observed in the previous year, it is therefore sound practice to spray the plants in the seedbed and then at intervals of 2–3 weeks after transplanting them into the field.

Magnesium salts applied to the soil give long-term protection against further trouble from the disorder. This involves the application of dolomite in quantities determined by the level of acidity in the soil as well as its magnesium status but seldom less than 1 ton per acre or, alternatively, an application of magnesium sulphate at the rate of not less than 56 lb. per acre.

In both cases, the material is evenly distributed over the surface of the ground when the land is being prepared for planting the crop. Subsequent tillage operations will incorporate it into the soil.

STORAGE OF PUMPKINS.

It is found necessary at times to store pumpkins. As soon as the crop is ripe, the fruit should be picked and stored under cover, preferably on slatted shelves in a dry airy shed. They should be examined from time to time, and any showing sign of decay should be removed.

Immature pumpkins will not keep like ripened ones, but will go mouldy. Frosts will often be the cause of a percentage of immature pumpkins and care should be taken to use these as soon as possible.

A ripe pumpkin will keep throughout the winter provided it is harvested with a short stalk attached.

—O. L. HASSALL, Senior Advisor in Agriculture.

SOME HAZARDS OF SHEEP HUSBANDRY

Plate 1.—A sheep suffering the inco-ordination that accompanies "weir-vine" poisoning. Destruction of the vine is by grubbing and arsenic poisoning.

Plate 2.—Sheep suffering fits as a result of eating yellow-wood. No remedial treatment is known. some sheepmen try to clear their properties of this pest.

Plate 3.—Eagles destroy young lambs; sheepmen destroy eagles.

Plate 4.—Sheep burnt in a 1957 bushfire near Muttaburra. Wise sheepmen insure sheep and fences against the ravages of bushfires, plough wide breaks, and burn between them.

IMPROVEMENTS BRING REWARDS

PLATE 1.—Water is the key of life for man and stock in the sheep country. Modern equipment puts down an excavated tank on a western Queensland sheep run.

PLATE 2.—Drenching sheep for worms in a modern welded-piping race with cement floor and "cat-walk" for easy drenching.

PLATE 3.—Windmill pumping sub-artesian water into a "turkey's nest" receiving tank in western Queensland. Modern cement trough in foreground has surrounding concrete apron and neat guard rails.

PLATE 4.—"Wool away!" Seventy-four bales (about 10 tons) of the "golden fleece" loaded ready for transport to market.

Plate 1.

Looking for Scrub Ticks in a Working Dog's Ear. This area, and between the dog's toes, are most favoured by the ticks.

Know The Tick That Causes Paralysis

By P. H. McCARTHY, Assistant Veterinary Officer.

Very early in the history of Australia, it was realised that a certain tick was causing a type of poisoning in domestic animals. The poisoning led to weakness and inco-ordination of the limbs, paralysis, difficult breathing and in many cases death.

Here the life history of this tick is discussed, together with the clinical symptoms it produces in most of our domestic animals.

Methods of treatment are given, and a number of precautions to be taken during the season when this tick is most numerous are explained.

It is now known that the scrub or dog tick (*Ixodes holocyclus*) is the only tick species in Australia to cause the paralysis. Several other tick species overseas, which do not occur here, can cause similar symptoms.

Dogs and sheep (if sheep are in the coastal area) appear to be the most susceptible animals, but adult cattle, calves, foals, pigs and on rare occasions Muscovy ducks may be affected. Among the native fauna bandicoots, kangaroos and wallabies

may be susceptible, although symptoms of paralysis are seldom produced.

WHERE DOES IT LIVE?

The tick can exist only in moist, humid areas. It cannot survive in the dry climate and extreme temperatures such as occur in Western Queensland in summer and winter.

Therefore the scrub tick is confined to the coastal belt of Queensland. It is prevalent in the rain-forest areas such as the Atherton Tableland, the McPherson Range and the Bunya Mountains. It also inhabits areas of the Brisbane and Fassifern Valleys, and has been reported in the Warwick district.

Within the coastal belt, local areas of approximately a few square miles may be much more heavily infested than the surrounding district.

LIFE HISTORY.

The scrub tick, found also in New Guinea, Indonesia, and parts of India, occurs on certain native animals living in the scrub areas. Of these, the commonest in Queensland are the possum and two types of bandicoot. The domestic animals can be regarded as accidental hosts only.

The male tick is brown in colour and about $\frac{1}{8}$-in. long. The unfed female is slightly larger, and its colour may vary from a grey to a brown. The female tick lays from 2,000 to 3,000 eggs on the ground, and in warm weather they hatch in about two months. The larvae may attach themselves to any of the domestic animals, engorge on the animals' blood for about a week, then drop off.

Within a month they moult to give what is known as a nymphal tick. Within a fortnight the nymph has attached itself to a second animal, engorged and dropped to the ground again. From 3 to 10 weeks later the nymph moults.

The resultant adult becomes active, and crawling up the vegetation, attaches itself to passing animals. The adult female engorges in from 6 to 21 days, depending on warm or cold weather respectively. The male tick does not attach itself to any animal nor suck blood.

Because the female tick attaches itself to three different animals during its life cycle the tick is spoken of as a three-host tick.

Depending on environment the complete life cycle may take from 240 to 740 days, or even longer. Larvae and nymphs can be dormant on the ground for relatively long periods. This makes it possible for the species to survive the winter period. The life cycle shortens in summer time, and the overall incidence of the scrub tick rises.

MOST FREQUENT IN SUMMER.

It is therefore during the summer period that cases of tick paralysis in animals are most frequent.

However, in the North, it may be possible to get cases at any time of the year. Another factor on which the incidence of ticks relies is that it frequents undergrowth and scrub and in these areas has a better chance of attaching to passing animals. This undergrowth in turn will rely to some extent on the rainfall of the previous year.

Paralysis may follow the attachment of female ticks, and one alone is capable of causing paralysis even in large dogs. In the dog, nymphs usually give only very mild symptoms although heavy infestations can cause definite paralysis. Little harm is caused by the larvae even in great numbers.

In the larger animals it is generally agreed that a number of females is needed before symptoms of paralysis are apparent.

Scrub ticks may attach themselves to any part of the body but in the case of the dog they are usually present around the head and ears, or between the animal's toes. In sheep they seem to become attached around the head area, particularly around the eyes and lips. Before the adult attaches herself, however, she may wander for as long as 24 hours over the host's body.

HOW IS THE ANIMAL AFFECTED?

Since dogs are more often affected than the larger domestic animals, and have been more intensely studied in the laboratory, the symptoms will be discussed firstly for dogs and then for the other animals.

Not all scrub ticks are capable of producing symptoms, and when they do, a period elapses between attachment and the first clinical signs. This might be as soon as four days in adult dogs, but may be more sudden in puppies. This time lag depends mainly on the rate at which the tick is engorging.

When signs are first noticed the dog shows a slight loss of control of the legs. This becomes more marked and in 2 to 3 hours the dog may be unable to walk. This loss of control rapidly extends to the muscles of the front legs and the affected dog will be unable to raise itself. It finds great difficulty in swallowing, while respiration becomes slow and difficult.

Death finally results from paralysis of the muscles of the diaphragm, which are responsible for breathing.

The pupils of the dog's eyes are usually dilated but although the nervous system is severely affected the dog is fully conscious. This is shown by the fact that it is aware of any activity in its immediate surroundings and can always recognize its owner.

The general symptoms described in detail for dogs are similar to those in the larger animals. However, as stated previously, it is thought that more than one tick is needed to cause definite symptoms of paralysis. Among cattle, calves seem to be more affected, although serious losses have been recorded in older animals also. Often deaths occur in herds on hilly scrub country or in areas just cleared. On the other hand, cows have often been seen with heavy infestations and they apparently show no ill effects. In some cases death occurs within a short time while in others it may take a period of weeks.

In sheep, heavy losses have been recorded when flocks have been held on the coastal areas. Most of those showing symptoms of paralysis have died about 8 days after becoming infested. Others, however, linger for about a fortnight.

With regard to horses, although isolated cases of paralysis have been seen in adult animals after massive infestation, foals are more susceptible. In general, if tick infestation is heavy enough in foals to cause paralysis, recovery is not common. There is on record, however, one instance where the foal recovered after a fortnight.

Tick paralysis in pigs is not uncommon on those farms in the coastal areas where suckers and weaners are running freely. This is particularly the case where there is a lot of undergrowth in heavy rainfall areas. Death usually follows paralysis lasting two days.

THE POISON.

It has been shown that the poison or toxin is injected from the salivary glands of the engorging tick. The exact chemical nature of the toxin is not known as yet and it has even been suggested that there may be more than one toxin.

From a study of the clinical effects, together with microscopic examinations of the nervous system, it is

thought that the toxin acts on certain areas of the brain, temporarily disrupting the functions of the nerves which control muscular movement.

Recently, studies have shown that the junctions between the nerve fibres and the muscles they control may also be temporarily damaged.

IMMUNITY.

In the dog it has been shown that immunity to scrub ticks is not inherited from tick-immune parents. The immunity is obtained by being exposed to ticks for a considerable time. It is lost after six months if the dog is not again exposed to reinfestation. The serum from such dogs can be used to immunise other dogs but protection will only last for about a fortnight.

In large animals the immunity has never actually been tested. It is known, however, that the larger animals are not so frequently affected as dogs, and heavy infestations have been known to cause no apparent harm in cattle. However, several other factors, such as size of the animal, may play a part.

PREVENTION.

In coastal areas, dogs, particularly long-haired breeds, should be combed or thoroughly examined once daily during the summer. The best method of prevention is a weekly bath in benzene hexachloride (BHC) solution (following the manufacturer's directions). This will give a good protection. Anti-toxin serum is of little use because it gives an immunity for a fortnight only. Therefore repeated injections would be necessary, and in most cases this would be economically impossible.

Plate 2.

Working Dogs, in the Coastal Areas of Queensland, Should Be Examined Once Daily to Detect the Presence of Scrub Ticks. One of the first places to look is between the toes. The best method of preventing tick paralysis is a weekly bath in benzene hexachloride (BHC) solution.

TREATMENT FOR DOGS.

1. The tick when found should be pulled out. The use of kerosene or turpentine is not warranted as the salivary glands always come away with the body.

2. Continue searching in case there is more than one tick.

3. Injection of anti-toxin serum has been found to be the only treatment of any value. In the early stages of paralysis a 10 c.c. dose may be given with good results. In the later stages much higher doses will be warranted. In these more advanced cases, however, results are not always satisfactory.

4. Because the functions of all nerves are impaired, including those involved in swallowing and control of the larynx (that is, the entrance of the windpipe), food or liquids should never be forced down the affected animal's throat. Some may go down the windpipe and cause pneumonia.

5. Keeping the animal warm, and turning it on to the opposite side at frequent intervals, are also advisable.

6. Veterinary attention, if available, is warranted.

Prices at Brisbane Wool Sales

Sale.	Month.	Number Bales sold.	Average Price per bale.	Average Price per lb.	Value.
No.			£ s. d.	d.	£
1.	Aug. 57	69,799	99 5 8	79·17	6,929,875
2.	Sep. 57	70,422	98 14 8	79·99	6,952,955
3.	Oct. 57	69,426	91 1 4	73·88	6,321,852
4.	Nov. 57	70,871	83 3 2	68·27	5,893,460
5.	Dec. 57	68,156	76 0 0	63·06	5,180,678
6.	Feb. 58	64,162	83 8 0	68·49	5,351,064
7.	Mar. 58	65,514	73 15 1	59·32	4,831,894

—Sheep and Wool Branch.

BIRDWOOD GRASS.

Question: "A.R." of Alpha has forwarded a grass specimen for identification. He observes that the grass is growing well in the district on red forest country.

Answer: The specimen proved to be Birdwood grass which is a relation to buffel grass.

Birdwood grass is hardy and palatable. In Western Australia it has been adapted to a wide range of soil types and conditions. It is not so rapid in spreading under natural conditions as buffel grass. Buffel grass on the other hand does not seem to be nearly so frost resistant as Birdwood grass. When the winter is mild Birdwood grass will often grow sufficiently well to give the impression of being a winter growing grass.

—Agriculture Branch.

Treat Stake Wounds In Horses Quickly

By D. J. WEBSTER, Assistant Veterinary Officer.

The working of horses in timbered country can be a hazard for both horse and rider. From those fallen trees or dead branches come the stakes that can kill a horse outright or inflict an injury which will cripple him for the rest of his life.

Many such injuries seem trifling when first inflicted but if untreated can cause untold suffering and finally destruction of the animal. Correct treatment in the early stages can make all the difference.

The very nature of the injury spells danger as in almost every case it is a stab or punctured wound, and these are the most difficult to treat from the outside. Allied to this is the fact that in almost 100 per cent. of mishaps a piece of the wood will break off and remain embedded in the wound.

Sterile objects such as metal splinters and bullet fragments may penetrate the flesh and remain there without causing serious ill-effects once the initial wound heals. Fragments of wood, however, are always heavily contaminated and always set up festering which causes pain, lameness and slow destruction of the surrounding parts, even if the initial wound appears to have healed.

A stake may enter through any part of the horse's skin or even the hard wall or sole of his foot. Many of the wounds occur below the fetlock, especially round the coronet.

REMOVE THE WOOD.

The first thing to do is to remove the offending piece of wood. Even with a green or new wound this is difficult, as in most instances the wood is not visible.

If you have a veterinary surgeon in your district then is the time to seek his services, for he has at his disposal the necessary drugs and equipment both to restrain the horse and remove the stake. If no veterinary surgeon is available a long pair of artery forceps, or stake pliers, as they are called, may be used to withdraw the stake.

This is frequently a painful job and a spirited resistance by the horse can make it impossible. Good restraint from the commencement of the job will greatly reduce the pain by making possible a quick, clean and thorough job.

After-treatment of the stake wound is most important. Remember it is a deep injury and therefore the application of antiseptics (no matter how strong) to the surface of the wound may fail to stop infection. Even sulpha drugs applied to the surface may give disappointing results. Injection of one of the antibiotics such as penicillin would be desirable. This should be done before infection develops.

USE DRAWING AGENTS.

Even if you can remove the wood and administer penicillin, perhaps the best way to treat these wounds is by the application of drawing agents. The drawing agents most commonly used are heat and chemical substances. The latter draw by reason of the fact that they absorb water.

Heat in the form of poultices is not really a drawing agent as it acts by softening the tissues and increasing the effusion of fluids from them. Hot foments, antiphlogistine and hot wet bran are commonly used.

The necessary attributes of a good poultice material are: (i) ability to retain heat for a considerable time; (ii) freedom from germs or at least no gross contamination; (iii) cheapness, reasonable availability and easy retainment as a dressing.

If heat is to have any effect it must be applied for a long time. Antiphlogistine or bran, if applied correctly, have the power to hold heat and give a continuous effect.

The chemical drawing agents most commonly used are Venice turps and glycerine-epsom salts paste. Venice turps consists of resin, turpentine and linseed oil. Resin absorbs fluid, and therefore draws, while turpentine irritates tissues, increasing the effusion of fluids. Epsom salts and glycerine absorb fluids and draw them out of the tissues.

A remedy occasionally used in the bush is the insertion of a grain of strychnine into the wound. This could only act by absorption into the blood stream and causing a general tightening of the muscles through the central nervous control. In some instances this may make the withdrawal of the stake easier but the risks of such treatment are obvious.

STAKE THROUGH CORONET.

When a stake enters downwards through the coronet. and becomes embedded under the wall of the hoof, it is extremely difficult to shift. Some success may be attained by removing a triangular piece of the hard wall directly below the wound. Generally, because of bleeding, it is impossible to see the stake and remove it, but the application of a drawing agent to this area may bring the wood out.

Sometimes stake wounds may not appear to be serious until some time after the injury. In these cases the original wound may have healed and the horse may show only a swelling of the affected area. If this is soft and hot, treatment with hot foments or poultices plus the injection of penicillin may be successful, as the swelling may then point and be opened. Sometimes the stake will come out through this second opening.

If, however, the swelling is hard, and shows signs that it has broken out and healed in a number of places, or if there are several openings in it exuding pus, then treatment in most instances will be unsuccessful.

Prompt, careful attention will help to heal many a stake wound. However, nothing can be more disappointing than to see a horse develop tetanus after such careful nursing. You can avoid this either by having your horses vaccinated against tetanus or by injecting them with tetanus antitoxin immediately they are injured.

☆ ☆ ☆

The wise farmer drenches young stock now—and gives them a worm-free winter. He feeds small amounts of meal to calves daily, knowing that well fed calves resist worm infestations.

Coccidiosis of Poultry

By P. J. O'SULLIVAN (Parasitologist, Animal Research Institute, Yeerongpilly), and B. W. MOFFATT (Adviser, Poultry Branch).

Coccidiosis is the name given to infections of the intestine caused by microscopic parasites known as coccidia.

Wherever chickens are kept under artificial conditions coccidiosis is apt to be the greatest hazard in their successful rearing. The disease causes enormous economic loss through deaths and decreased egg production due to the poor development of many of the chickens which survive an outbreak.

In the last few years treatment with sulphonamides has greatly reduced losses from coccidiosis, and poultry farmers have spent large sums on these drugs. It is considered wiser, however, to prevent coccidiosis by management based on knowledge of the parasite and the disease rather than to rely on drugs to control outbreaks after they occur.

Coccidia occur in most domestic animals, but each species is confined to a particular type of animal. Thus the coccidia of fowls are unable to survive in any other animal. Similarly, the coccidia of turkeys, ducks, geese, and other birds and animals cannot infect fowls.

Several different species of coccidia infect the intestines of fowls. Their effects range from a mild catarrh of the intestine to severe disease with extensive inflammation and haemorrhage resulting in death.

Two species of coccidia are important in fowls. They are *Eimeria tenella,* which causes caecal coccidiosis, and *Eimeria necatrix,* the principal cause of intestinal coccidiosis. Several other less harmful species infect fowls but they cause disease only on odd occasions.

LIFE CYCLE OF COCCIDIA.

Infection follows the swallowing of a mature (or sporulated) coccidia "egg", known as an oocyst, with the food or water, or from the litter. The digestive juices of the bird release from the oocyst, forms known as sporozoites, which invade the cells lining the intestine (Plate 1). These sporozoites grow bigger at the expense of the invaded cells and then divide into numerous small merozoites, which in turn invade other intestinal cells.

This type of reproduction without sexual union goes on for two generations, then some of the merozoites develop into male and female forms which mate to produce the oocyst or "egg".

The oocyst has a thick shell and is passed out of the host in the droppings (Plate 2). In the presence of warmth, moisture and oxygen, further development takes place, so that in 48 hours or longer the oocyst has matured or sporulated (that is, contains sporozoites) and is then capable of infecting a chicken.

The sporulated oocyst is very resistant and is capable of surviving in moist, shady places for many months. Sunlight and dryness destroy the oocysts, but they are very resistant to disinfectants.

The droppings of sick birds contain enormous numbers of oocysts. Chickens which appear healthy after recovery from coccidiosis may pass out smaller numbers of oocysts for many months. These oocysts are scattered in and about the litter and the feed and water troughs, from which they are picked up by susceptible fowls.

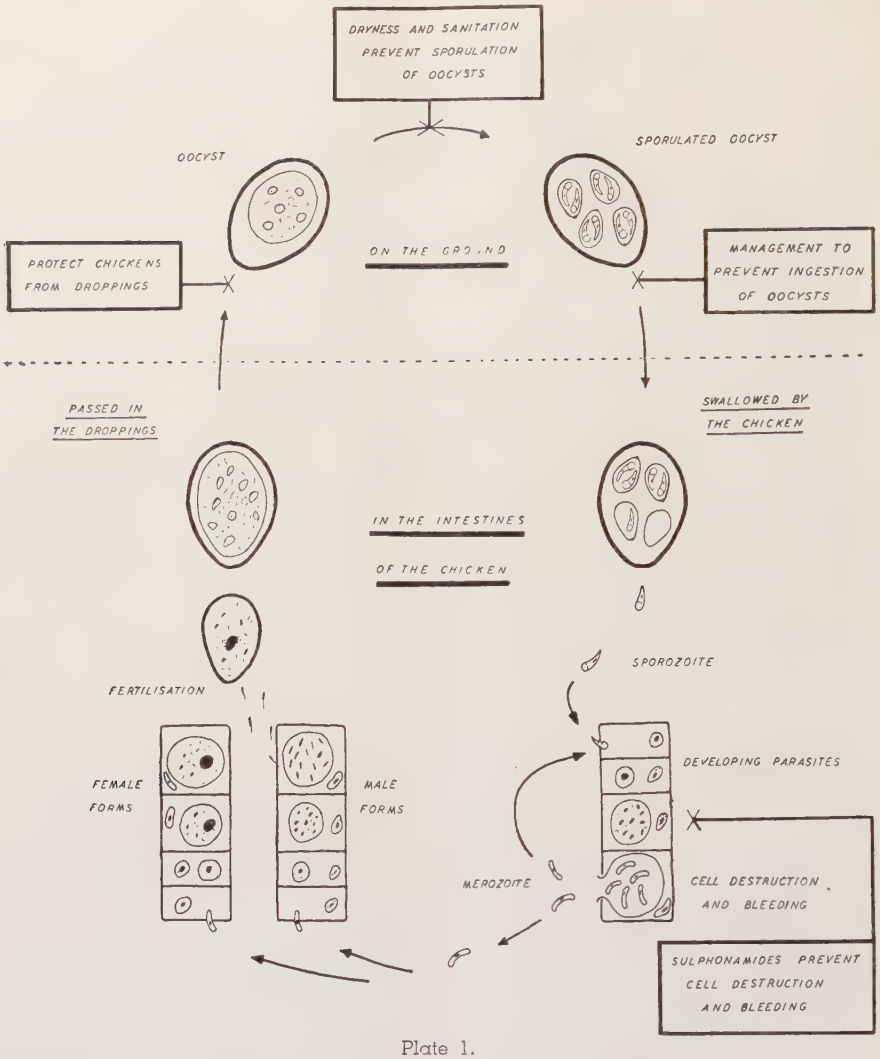


Plate 1.

Diagram of the Life Cycle of Poultry Coccidia.

Oocysts may be spread from pen to pen or from farm to farm on boots, buckets, crates, and other equipment.

CAECAL COCCIDIOSIS.

This is the commonest form of coccidiosis and is responsible for heavy losses. It occurs most often in chickens between 4 and 10 weeks of age, but younger or older birds are occasionally affected.

Symptoms.

Severely affected birds appear depressed and huddle tgether with their feathers ruffled as though they were cold. The wings droop and the shanks and comb are pale. The thin watery droppings may contain blood, which often stains the tips of the wing and tail feathers. In some cases the droppings appear to be all blood.

In less acute cases, there is a listlessness, paleness, and ruffled plumage, and the droppings may show a brownish tinge indicating the presence of blood.

There is usually rapid loss of weight. The appetite is depressed. Water consumption is greatly increased in the early stages of the disease but is

Plate 2.

Coccidial Oocysts in Intestine of a Chicken (magnified approximately 400 times).

decreased during the acute stages and does not return to normal unless and until the birds start to recover.

Up to 60 per cent. of affected chickens die in severe natural outbreaks.

The acute stage of the outbreak usually lasts one to two weeks, but occasional deaths occur for several more weeks. In mild outbreaks deaths are spread over a longer period because only a few chickens pick up large doses of oocysts at any one time.

Chickens that have shown definite symptoms and have recovered from coccidiosis are generally stunted and more susceptible to other diseases and parasites. Often the effects are still noticeable when the birds come into production.

Recovered chickens have a strong immunity to further attacks of caecal coccidiosis, but they are still susceptible to the other forms of coccidiosis which affect the small intestine.

Post-Mortem Findings.

In acute cases the lining of the caeca (blind guts) is extensively eroded (ulcerated), and the caeca are

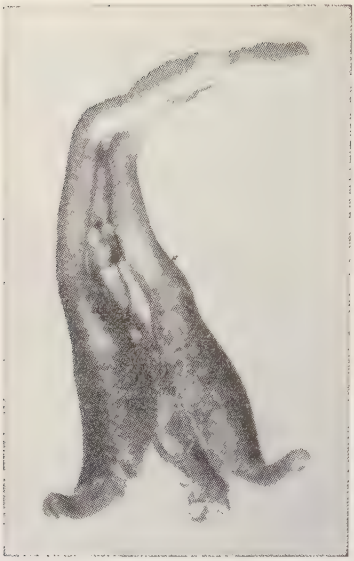


Plate 3.

Caecal Coccidiosis. Caeca (blind guts) distended with blood and showing haemorrhages in walls.

filled with blood. In less acute cases, the caecal wall is thickened and ulcerated and shows bloody patches (Plate 3). A cheesy core tinged with blood is often present, particularly in the later stages of the disease.

In mild cases microscopic examination may be necessary to detect the disease.

An accurate diagnosis should be made quickly so that treatment can be started before the whole batch is seriously affected.

The caeca of young chickens affected with pullorum disease, or of older chickens affected with blackhead (histomoniasis), may contain cheesy cores similar to those seen in coccidiosis. Thus laboratory tests may be necessary to differentiate these diseases.

Control Measures.

It is almost impossible to keep chickens entirely free from coccidia. When a chicken swallows a *small* number of oocysts it usually suffers no appreciable harm, but if the environment favours the spread and survival of oocysts such a bird may initiate an outbreak of coccidiosis. The swallowing of a *large* number of oocysts produces disease.

A small number of oocysts may be brought into a pen by utensils or the boots of an attendant, or may be already present within the pen. A few chickens pick up these oocysts, the parasites multiply within their bodies, and then large numbers of oocysts are passed in the droppings. Other chickens become infected and so the pen may soon be heavily contaminated.

Thus to prevent coccidiosis, one should aim to—

(1) Develop a system of management which prevents the chickens from picking up a large number of oocysts.

(2) Make conditions as unfavourable as possible for the survival of oocysts.

A large accumulation of oocysts occurs where the droppings of chickens collect, namely under the roosts and around the feed troughs and water vessels. By preventing the birds from having contact with droppings in such places, losses from coccidiosis are reduced.

Small mesh wire-netting on or under the roosts prevents access to much of the droppings. The netting also prevents chickens from eating any bloody

droppings and so enables a potential outbreak to be detected before many chickens are affected.

Feed troughs and water vessels should be so constructed and placed as to prevent the birds fouling the feed and water with droppings.

Dampness of the litter, either from water vessels or from rain, makes conditions favourable for oocyst survival and may lead to an outbreak of coccidiosis.

Overcrowding increases the contamination on the floor and so increases the chance of the birds picking up massive doses of oocysts.

For chickens reared in intensive pens, thorough cleaning of the pen every two or three days prevents coccidiosis because it removes the oocysts before they have reached the mature infective stage. However, with present labour costs this procedure is impractical and other preventive measures are now preferred.

It is often difficult to control coccidiosis in flocks reared in semi-intensive yards. The earth floors cannot be cleaned, so it is important that overcrowding be avoided and that the yards be absolutely dry in all parts.

Deep dry litter is an effective labour-saving method of controlling coccidiosis in chickens reared intensively.

Any good dry litter such as wood shavings or sawdust may be used, but it must be about 6 in. deep. It is thoroughly stirred every day or so and care is taken to redistribute it about the feed and water troughs. Patches of damp or wet litter must be dealt with promptly. An inch or so of new litter may be added from time to time according to the degree of contamination of the litter already present. The litter may remain unchanged for 8-12 weeks, but a complete new litter should be provided for each fresh batch of chicks.

The effectiveness of deep litter in controlling coccidiosis apparently depends on two factors. Dilution of the droppings by stirring them into the litter prevents the chickens from swallowing big doses of coccidial oocysts. Secondly, the droppings are dried out, so most of the oocysts fail to reach the mature (sporulated) infective stage.

Poorly nourished chickens have low resistance to coccidiosis, worms and other diseases. If the ration fed to chickens is deficient in protein, vitamin A or riboflavin, the flock is apt to suffer severely from coccidiosis.

The best ration procurable is therefore always a wise investment. It should contain 18-20 per cent. protein for birds up to 8 weeks of age and adequate amounts of other nutrients, especially vitamin A and riboflavin as set out in Departmental pamphlets.

From work undertaken at the Animal Research Institute, Yeerongpilly, there are strong indications that the rations should contain 8 per cent. of buttermilk powder to assist in combating coccidiosis. It was noticed in this work that birds fed a ration containing 8 per cent. buttermilk powder did not succumb to caecal coccidiosis to the same extent as did birds on rations not containing buttermilk powder.

Although outbreaks of coccidiosis can now be quickly controlled with drugs, it is always wise when outbreaks occur to check the ration carefully to make sure that it supplies all the nutrients required for rapid growth of chickens.

Treatment of Coccidiosis.

The main drugs used in controlling outbreaks of coccidiosis are sulphaquinoxaline, sulphamerazine, sulphadimidine, nitrofurazone and nicarbazin.

Sulphaquinoxaline can be used as a preventive or a curative and can be administered in mash or water. It is sold in powder and liquid form to be

used in the mash at the rate of 0·05 –0·1 per cent. or in the drinking water at a strength of 0·025–0·05 per cent. As the numerous commercial products available contain various amounts of the active principle, it is wise to follow the manufacturer's directions as to dilutions.

Treatment through the drinking water is preferred because sick birds will drink when they will not eat.

Sulphaquinoxaline can be used as a preventive when fed continuously in the mash at 0·0125 per cent.

Sulphamerazine and *sulphadimidine* are usually sold as soluble sodium salts, the commercial preparations on the market being 16 per cent. solutions. These should be given in the drinking water at a level of 0·2 per cent. This strength can be obtained by adding 2 oz. of the 16 per cent. solution to each gallon of drinking water.

These three drugs are very effective in controlling outbreaks because they have the greatest effect on the stage of the parasite that causes bleeding. They have little effect on the sporozoites or the first non-sexual generation, so the infection is not completely suppressed and the bird can acquire immunity to the disease.

To allow the birds to acquire an immunity when using any of the above drugs, the interrupted system of treatment is the most suitable. This consists of giving the drug in the mash or water for three days, then giving untreated mash and water for two days, then giving further treated mash or water for three days.

Other schedules have been used successfully, such as two days on medication, three off, two on, three off, and a final two days on medication.

However, in severe outbreaks, when using sulphaquinoxaline, the higher level of the drug (0·1 per cent. in the mash or 0·5 per cent. in the drinking water) should be used for three days, whichever schedule is adopted. For the remaining two lots of 2-day treatments, the drug can be used at the lower level. The higher level for the first three days is to ensure that the outbreak will be brought under control quickly.

The above treatments may control mild outbreaks so quickly that a portion of the flock is not exposed to coccidia and so does not develop immunity to the disease. In such cases, the disease may reappear later in the non-immune chickens. To overcome this, some workers have recommended that mild outbreaks be treated with the drug at half-strength, giving treatment for six days on a two days on, three off, two on, three off, two on basis.

Chickens may drink somewhat less when these drugs are added to the drinking water, but there is no evidence of ill-effects from reduced water consumption during the period of treatment recommended. Prolonged treatment on high levels is likely to be harmful.

Nitrofurazone is used both as a curative and a preventive drug. When used as a preventive, it is fed in the mash continuously from day-old to approximately 10 weeks of age at a level of 0·005–0·006 per cent. When used as a curative, it is fed at the rate of 0·022 per cent. in the mash for seven days. It can also be used in water as directed by the manufacturer.

Nicarbazin is used only as a preventive and not as a curative. It is fed in the mash continuously at a level of 0·0125 per cent. It acts on the early stages of the parasite and so immunity may be delayed. For this reason, it should be fed for longer periods than the usual 8–10 weeks recommended for preventives. Nicarbazin should on no account be fed to laying birds because of an adverse effect on egg production and also because the eggs produced are likely to be unsaleable through mottling of the yolk.

INTESTINAL COCCIDIOSIS.

This disease is seen most often between 8 and 12 weeks of age, but birds of all ages may be affected. The parasites responsible for intestinal coccidiosis are *Eimeria necatrix* and *Eimeria maxima*. Other less harmful species of coccidia, such as *Eimeria acervulina*, also infect the small intestine.

Affected birds lose condition and become weak and anaemic, with ruffled feathers, and the shanks become pale and dry. The droppings are slimy and greyish and do not contain visible blood.

In severe outbreaks, deaths occur suddenly but usually the birds are sick for many days and deaths are spread over a few weeks.

The upper half of the small intestine is the site of the disease. The intestine is dilated and its wall is thickened and flabby. Haemorrhages occur in severe cases, so free blood may be found within the intestine. However, the blood is usually digested lower down in the intestine and so is rarely recognisable in the droppings.

A feature of coccidiosis due to *Eimeria necatrix* is the appearance of greyish-white spots, pin-head to match-head size, like fig seeds, which are visible from the outside of the intestine. These spots are colonies of coccidia lying deep in the wall of the intestine.

The lesions due to infection with *Eimeria acervulina* are usually confined to the duodenal loop of the bowel and show as greyish-white transverse patches on the tips of the villi (small, slender, conical projections of the lining). *Eimeria maxima* produces no characteristic lesions which would distinguish it from other infections of coccidia.

Adult fowls can suffer from chronic intestinal coccidiosis. The most common species involved in this case is *Eimeria acervulina*. Other species may be involved, but the damage caused by *Eimeria acervulina* tends to mask their presence.

Although most farmers quickly recognise caecal coccidiosis, they frequently overlook the intestinal form because of the absence of blood in the droppings or other striking symptoms.

Intestinal coccidiosis is diagnosed by careful post-mortem inspection, firstly of the unopened intestine to detect the white colonies of *Eimeria necatrix*, and secondly by opening the intestine and noting the thickness of the wall and bloody areas.

Symptoms similar to those of intestinal coccidiosis may be due to roundworm or tapeworm infestation and to other diseases, so a careful post-mortem examination should be done to determine which disease is present. In doubtful cases, a laboratory diagnosis is essential to confirm the presence or absence of coccidia.

Little experimental work has been done on the prevention and treatment of intestinal coccidiosis, but the methods used for caecal coccidiosis have proved helpful in outbreaks on farms. In all cases, however, it is wise to overhaul the management and quickly rectify any faults such as overcrowding, damp litter and poor feeding.

☆ ☆ ☆

● **Agricultural, dairying, and pastoral returns are due this month.**

A Letter from BALLYRANDOO

My Dear Son,

Thank you for your letter. I was interested concerning the trouble you are experiencing in getting the sheep to run in the new sheep yards. You say the yards are good except for the drafting race, where the sheep bail up and will not run. Your good description of the sides of the drafting race that were made from 6 in. x 1 in. hardwood fixed horizontally with 3 in. spacings gave me a clue as to what may be wrong. I think the trouble is that the sheep can see through the gaps, and will not run because of this. Try closing up the spacings with 3 in. x 1 in. boards, and see what happens. I think you will find things simpler after that.

If you find the sheep jam back in the drafting race, you will be able to avoid this by putting in cross batons here and there across the floor of the race. These could be made of 3 in. x 2 in. hardwood. Sheep will step over them going forward, but will rarely back over them when their hind legs come up against one of the stops.

I found we did the wrong thing here this year by depending too much on the new insecticides for fly control. We let the sheep go through right up to lambing without crutching. Certainly the fly wasn't bad, but we got caught out in another way. The actual lambing was good but we had a lot of deaths in young lambs. The new-born lambs were not able to get a drink from their mothers because of the amount of wool inside the crutch and around the udder.

In future we will keep to our old plan of crutching the ewes about 4-6 weeks before lambing, about the same time as we give them the pre-lambing drench for worms. We can drench them off the board.

Affectionately,

Dad.

P.S.—Let me know how you get on with the drafting race.

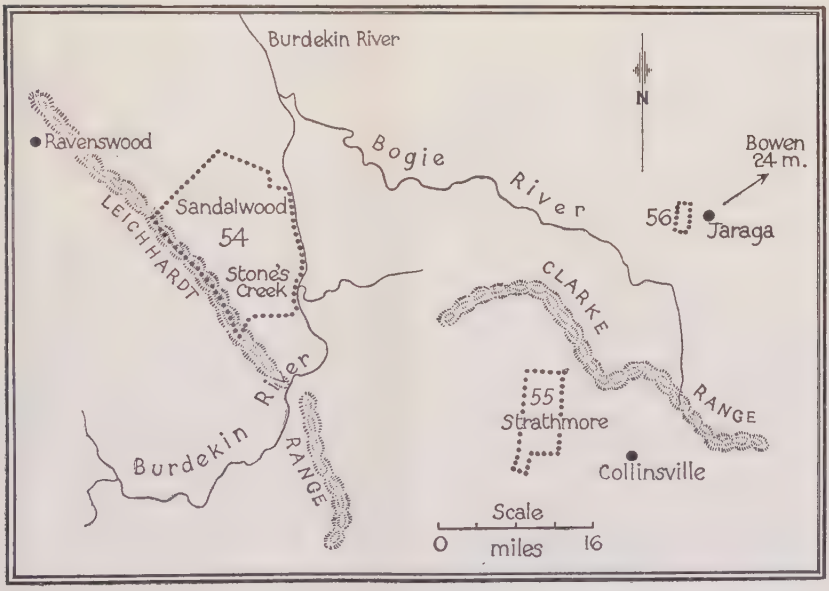
Queensland Fauna Sanctuaries

By C. ROFF, Fauna Officer.

(Continued from March, 1958.)

The following is an index of the sanctuaries outlined in Map 8:

Index No.	Sanctuary.	Area in Acres.
54	Stone's Creek and Sandalwood Holdings, Collinsville ..	99,200
55	Strathmore Holding, Campbell's Holding and Callaghan's Swamp, Collinsville	34,500
56	National Park Reserve 287, Mount Aberdeen via Jaraga ..	4,120

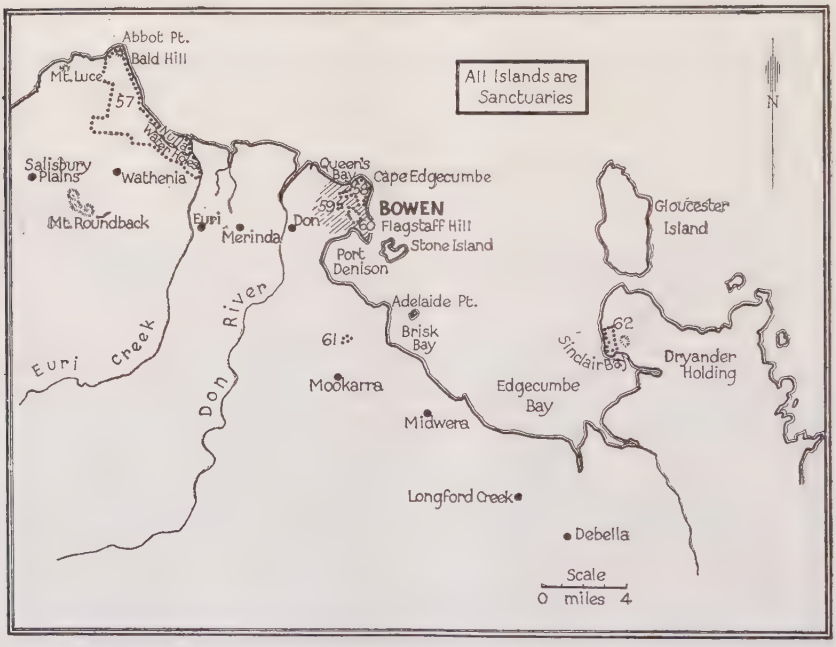


Map 8.

Map Showing Sanctuaries in Part of Fauna Districts Nos. 2 and 3. The boundaries (as at December 31, 1957) are delineated by dotted lines.

The following is an index of the sanctuaries outlined in Map 9:

Index No.	Sanctuary.	Area in Acres.
57	Salisbury Plains and Nulla Waterholes, Bowen	5,500
58	Pasturage Reserve, Cape Edgecumbe, Bowen	720
59	Muller's Lagoon, Bowen	59
60	Denison Park, Bowen	250
61	Camping and Water Reserve 11, Bowen	43
62	Wooler's Selection, Sinclair Bay, Bowen	368



Map 9.

Map Showing Sanctuaries in Part of Fauna District No. 3. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines.

[TO BE CONTINUED.]

Junior Farmers Aim At Good Citizenship

By J. PARK, State Organiser, Junior Farmers' Organisation.

In 1946 a committee of inquiry considered, along with other aspects of agricultural education, the formation of a Junior Farmers' Organisation in Queensland. In recommending that the organisation be established, the committee expressed the view that the Junior Farmers' Organisation should concern itself with the education of those young people of rural areas who had left primary school. Two years later, in 1948, the Junior Farmers' Organisation was being established as a branch of the Education Department, and to-day, with 138 clubs functioning, the organisation still aims to assist with, and encourage the continuation of, the education of Queensland youth, especially that of the young people of rural areas.

The idea of the Junior Farmers' Organisation being a medium for the extension of education is one which is fundamentally misunderstood, not only by the public, but also by club members and adult club advisers. There are those who believe that the activities of the club should be restricted only to those of a vocational nature, that is, that the Club programme should concentrate on attempting to make members better farmers. On the other hand, there are those who believe that young people will only attend their club if it provides "fun and games;" therefore, they conclude, its activities should be largely recreational in nature.

Both points of view are incorrect, and the retention of them by influential sections is inhibiting the progress of the movement.

COMMUNITY YOUTH GROUPS.

Junior Farmers' clubs are open community youth groups. In other words they offer membership to any young person in the community whose age lies within the prescribed limits of 15 to 25 years inclusive. Girls and boys, regardless of their occupation, may join. (In this respect the term "Farmer" may be considered to be something of a misnomer). The clubs are strictly "non-party political," and non-sectarian in their membership and administration, and in this State they are non-institutional. These facts are important and worthy of repetition in another way:

Any young person who has left primary school, regardless of occupation, race, or creed, may join a Junior Farmers' Club.

Having established the necessary qualifications for membership, consideration can be given to the question —"What then, should a Junior Farmers' club do?" It is around this question that most differences of opinion arise. That there are differences of opinion is very good, and for the continuing good health of the organisation, quite necessary.

It stands to reason that a club composed of young people from a large town or a suburb, with many facilities and ample scope for variety, will undertake activities different in kind and number from those which are offering to a club which has to meet in the local hall or school in a remote country district.

Plate 1.

Junior Farmers From All Parts of Queensland Attended the Animal Husbandry Course at Gatton College in January. Demonstrator is Mr. N. Hodgen, Assistant Instructor in Animal Husbandry.

It is reasonable, also, to find that a club in a cane-growing area in tropical North Queensland will carry out quite a different programme from one on the Darling Downs or in the Granite Belt.

In some clubs, we find a majority of girl members; in others, the youthful group far outnumbers the more mature members; to some clubs, assistance from business and instruction from Departmental officers are readily available, whilst other clubs are less fortunately situated; some clubs can muster transport easily, and good roads make travel to centres of interest or to other clubs a simple matter; in other centres, lack of suitable transport is a major problem, militating against co-operation with other clubs, and making difficult the organisation's efforts to overcome parochialism.

Finally, some clubs are fortunate in having the sympathetic understanding and guidance of parents and advisers; in other instances, unfortunately far too numerous, we find that parents and other citizens are apathetic, evincing little interest in the effort of the youth of the community to improve its lot.

TRAINING FOR CITIZENSHIP.

These are but a few of the factors which lead to wide differences in the activities of clubs throughout the State, but, despite these factors—and it will be noted that they are for the most part environmental, and beyond our immediate control—there can be unity of purpose, if not unity of action, throughout the Junior Farmers' Organisation. Once determine what this purpose should be, then clubs can choose their own means of reaching the goal.

Junior Farmers' clubs should aim to train young people to live better and more useful lives, in particular by offering specialised instruction to better fit them for their vocation, and for the practical business of citizenship.

That definition is important. It is offered as a guide to those who have been unable to satisfy themselves as to the aim of the Junior Farmers' Organisation. It will be noted that the statement places no particular emphasis on any one aspect of training, but indicates that a continuation of the process of *all-round development* should be aimed at.

Naturally, as the majority of members of the organisation are concerned with the vital business of earning their living, or of learning how to earn their living, the activities of the club, as an educational medium, will be biased towards vocational training, whether it be for farmers or for housewives.

But one all-important facet of this many-sided process of education is here singled out for special mention—training for the practical business of citizenship. It is perhaps in this field that the Junior Farmers' Organisation is at present doing its most effective work.

Consider for a moment the limitation placed on a club with regard to the time it has to provide the means of educating. Clubs meet monthly—sometimes fortnightly. No one expects farmers or housewives to be trained in "twelve easy lessons," so for this reason, if for no other, it is wrong to expect Junior Farmers' clubs to be responsible for turning out proficient farmers.

What is hoped for is the continued development of open and inquiring minds, and the stimulation in each member of a *critical* faculty, the possession of which implies the possession of knowledge, which in its turn implies alertness, mental activity, and study. It is hoped too, that favourable attitudes will be engendered towards life on the land, and towards the many agencies which are endeavouring to provide extension services for the people of rural areas, and for the man on the land in particular. If mental development along these lines is fostered by Junior Farmers' clubs, they are fulfilling one of their most important functions.

But let us return to the matter of training for citizenship. Here, as with all of its activities, the organisation recognises that theory is not enough. The Junior Farmers must put into practice the art of living with themselves, their neighbours, their fellow countrymen and people from other lands. They must develop social minds which enable them to mix with and understand their fellow men. They must seek out and apply the information which provides the background of citizenship—how their community life and its social institutions have developed. They must adopt and cultivate those habits and attitudes which will fit them to lead socially useful lives.

RUN THEIR OWN CLUBS.

How, it may be asked, can the Junior Farmers' Organisation hope to do this, any more effectively than it can train farmers? Well—the whole structure of the organisation has been designed to provide practical training for citizenship. Members are solely responsible for the running of their own clubs. They elect their own officers who administer the club according to a constitution which is based on democratic principles. Each club is in turn represented upon a Junior Farmers' Zone Council which is responsible for activities organised on a regional basis—there are at present 16 zones in Queensland. From each Zone Council, Junior Farmers elect a representative to a State Council. This State Council acts in an advisory capacity to departmental administrators, and has power to raise and spend its own funds in the interests of members.

Plate 2.

Inspection of Pasture at a Texas Junior Farmers' Club Field Day. Left to right: Junior Farmers G. Parker, D. Sharpe, L. Jones, and A. Pollard.

[*Photographs by courtesy of "Queensland Country Life."*

Acting on the assumption that if any social organisation is to be successful it must be open to criticism, and aiming to provide further valuable training, an annual conference of the organisation is held at which each club may be represented, and where full opportunity is given for criticism, and for the offering of constructive suggestions for improvement.

The structure of the movement in Queensland encourages members to play an active part in running their own organisation, and it helps to ensure that youth will adjust itself naturally and easily to adult living.

Reference was made earlier to the important part played in the Junior Farmers' clubs by adult advisers. The success of the Junior Farmer movement as a youth movement is due largely to the help given by these adults, and by members of the community at large. It is believed by the writer that young people, particularly adolescents, should not be herded together in groups which are cut off from the normal stream of social life. Their activities should at all times bring them into contact with a society which includes people of varying degrees of maturity and walks of life, and who manifest desirable achievements and accomplishments.

If success can be attributed to the Junior Farmers' movement in Queensland, credit for it may be shared by the State as a whole. By the members themselves; by the Government, its many agencies and its many selfless officers. By men of industry and commerce, who recognise the value and importance of rural youth. By farmers, who individually, and through their organisations have given so much support to the movement which is training the men who must follow them. By the mothers and country women everywhere who are concerned that their children should live better and more useful lives, and by the founders of the movement in this State, whose energy and foresight made the present structure possible.

Careers For Country Boys and Girls

No. 3.—Science

By E. T. HOCKINGS, Editor of Publications

Those boys and girls living in country areas who have a bent towards science will find rewarding work awaiting them if they sustain their interest to the point of gaining the university science degree. Thereafter they will find that their services are in strong demand. Particularly is this so in the youthful State of Queensland, where there are exciting challenges in the agricultural, horticultural, and pastoral problems that remain to be solved through their agency.

Queensland has vital need for more research workers in the scientific field; researchers specialising in entomology, botany, plant diseases, soil science, plant breeding, bacteriology, chemistry, physics, zoology, physiology, biochemistry, and mathematics.

These valuable workers will be recruited from the ranks of the graduates in science. Graduates of both sexes are wanted, and jobs are waiting for females as well as males in nearly all categories listed in this article.

THE TRAINING.

To enter the Faculty of Science at the University of Queensland, a candidate must pass at Senior standard in four subjects, including English, mathematics I, and a science subject. If chemistry, physics, and a language other than English are not

Plate 1.

Work of the Plant Physiologist Includes Investigation of the Water Requirements of Crop Plants.

included in the four subjects, the candidate must pass them at not less than Junior standard.

Science, or pure science, as it is called, is a three-year course for the pass degree; four-year for the honours degree. The student has a wide choice of subjects, including chemistry, physics, mathematics, geology and mineralogy, metallurgy, botany, zoology, entomology, genetics, physiology, biochemistry, and bacteriology.

For a pass degree, students must obtain credit for 28 units, eight in first year, 10 in second year, and 10 in third year. Most of the subjects listed have a four unit value; some subjects are subdivided into two sections, each rating as an independent two unit subject.

In the first year, the eight units must be spread over four subjects. In second year, the 10 units must include at least two second year subjects. In third year, the 10 units must be taken from at least two subjects. Students can finally specialise in any one of the subjects listed, provided the relevant prerequisite subjects have been passed in earlier years.

One subject only is taken in the fourth year for the honours course.

Recruits to the Public Service are taken mainly from the pass degree group. Research work in Government Departments offers prospects for the attainment of higher degrees such as M.Sc. and D.Sc.

Complete details are given in the Faculty of Science Handbook, which is available at the University.

THE COST.

The fee charged for the course is £217, plus compulsory fee of £6 10s. for sports and allied activities.

Science students may obtain the benefits of the Commonwealth Scholarship Scheme, and other scholarships are also offered by the Department of Agriculture and Stock.

A number of other fellowships, scholarships, prizes, and similar awards are available to undergraduates and graduates in the Faculty of Science, details being listed in the Faculty Handbook.

THE WORK.

Many students favour pure science before agricultural science because they feel that the former course gives a better knowledge of such important subjects as physics and chemistry, and equips them more thoroughly for research work relating to the plant and animal kingdoms.

Here is some information on the subjects in which science graduates may specialise, with some estimations of employment prospects (taken from the University brochure, "Courses within the Faculty of Science and the Professions to which they may Lead"):

Botany.

Commencing with a general course in plant science, including the study of plant structure and of organisms causing disease in plants, the botany course proceeds to the study of plants in their natural habitat. Excursions are arranged to make students familiar with the Queensland flora under natural conditions, and with the principles of its distribution. The study of genetics, plant physiology, plant anatomy, and microbiology is also included in the course.

Botanists are employed by the Department of Agriculture and Stock* for work in the fields of plant pathology (diseases in plants), plant

* In this article, attention is directed mainly to jobs offered by the Department of Agriculture and Stock. It may be noted, however, that other Government departments and industries hold out employment opportunities for graduates.

physiology (mainly on the food and water requirements of plants), and in classification. There is a fairly constant demand for graduates in botany to undertake special research problems in this State.

Bacteriology.

The bacteriology course for science students at the Queensland University is the only purely academic course in bacteriology of a completely non-medical nature in Australia. It is of two years' duration, and is designed for students who intend to undertake research in this subject.

There is an increasing demand for graduates trained in bacteriology; one of the popular fields of employment for female graduates is the Dairy Research Branch of the Agriculture Department.

Chemistry.

The course in chemistry covers the various branches—inorganic, organic, and physical—with some specialisation in either organic or physical chemistry in the third year. A greater degree of specialisation is possible in the post-graduate year.

There is an increasing demand from Government departments for pass and honours graduates in chemistry, particularly in the field of agricultural research.

Geology and Mineralogy.

The courses in geology and mineralogy serve both as an introduction to more advanced geological work and as complete short courses in the subjects for those scientists and others whose principal interests lie elsewhere, as for example, in soil science.

Plate 2.

Plant Pathology.—Microscopic examinations of a fungus suspected of causing plant disease. The young woman is selecting portions of the fungus from a culture in a petri dish. The pressed specimen on the table is the dressed leaf from which the culture was obtained.

[*Photographs by courtesy of the University of Queensland.*

Mathematics.

Government departments, including the Department of Agriculture and Stock (biometrical section), maintain research sections where mathematicians are employed, especially on statistical work, and for designing and interpreting experiments.

Physics.

Within recent years there has been a marked increase in the demand for trained physicists. They are being sought by Government laboratories and research associations set up to assist primary and secondary industries, in the teaching profession, and in such fields as radio and television engineering.

Physiology.

The study of physiology leads to specialisation in the direction of biochemistry and of animal production.

Positions are open in the Department of Agriculture and Stock for workers with a scientific training based on physiology and biochemistry. The work they do is mainly related to diagnosing animal diseases, analysing specimens where nutritional disorders in livestock are suggested, and carrying out investigations in liaison with animal or plant husbandry branches.

Zoology and Entomology.

The first-year work in zoology is devoted to a self-contained course giving a synopsis of the animal kingdom. Work in the later years includes the detailed study of invertebrate and vertebrate animals, genetics, comparative physiology and embryology, and provides for excursions to marine and freshwater environments, including the Great Barrier Reef. In addition, advanced studies are undertaken in morphology, ecology, and control of insects. Honours graduates in zoology who have specialised in entomology are urgently needed throughout Australia.

THE SALARY.

Male graduates in science who are employed by the Department of Agriculture and Stock commence at a salary approximating £1,135 a year, inclusive of "cost of living" adjustment. This salary advances by annual increments, and after 11 years of training and experience, a salary in the region of £1,580 would be attained.

Promotion may then follow to more senior appointments with higher salaries.

Group Action Against Drought

South Burnett dairy farmers and graziers, at a recent meeting in Kingaroy, showed their mounting interest in co-operative action to combat drought. Many believe that co-operation, in one form or another, is the best practical solution to the problem.

At the meeting it was argued that the high cost of equipment was the major obstacle in the way of fodder conservation, not the technical task of conserving the fodder.

Farmer-operated machinery pools were suggested as a means of overcoming this difficulty.

Through a group, each member would have the use of machinery worth more than £1,000 for an outlay of £150 to £350 depending on the size of the group.

An alternative to a machinery pool was the employment of a contractor to harvest fodder crops for a group.